A STUDY TO ASSESS THE EFFECT OF MATERNAL LIFE STYLE FACTORS ON PREGNANCY COMPLICATION AND PERINATAL OUTCOMES

DISSERTATION SUBMITTED TO

THE TAMIL NADU DR.M.G.R.MEDICAL UNIVERSITY

CHENNAI

IN PARTIAL FULFILMENT OF REQUIREMENT FOR THE DEGREE OF

MASTER OF SCIENCE IN NURSING

OCTOBER 2015

INTERNAL EXAMINER:

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Certified that this is the bonafide work of

Ms. SULU SUSAN RAJAN
Omayal Achi College of Nursing
45, Ambattur road
Puzhal, Chennai – 600 066

COLLEGE SEAL:

SIGNATURE: _____

Dr. (Mrs.) S.KANCHANA
R.N., R.M., M.Sc. (N)., Ph.D., Post. Doc (Res).,
Principal & Research Director,
Omayal Achi College of Nursing,
Puzhal, Chennai – 600 066, Tamil Nadu.

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Approved by the Research Committee in April 2014

PROFESSOR IN NURSING RESEARCH
Dr.(Mrs.) S. KANCHANA _____
R.N., R.M., M.Sc.(N)., Ph.D., Post Doc. (Res.).,
Principal & Research Director,
Omayal Achi College of Nursing,
Puzhal, Chennai – 600 066, Tamil Nadu.

CLINICAL SPECIALITY – HOD& RESEARCH GUIDE
Mrs. R. VIJAYALAKSHMI
R.N., R.M., M.Sc.(N)., Ph.D.,, _____
Obstetrics and Gynecological Nursing,
Omayal Achi College of Nursing,
Puzhal, Chennai – 600 066, Tamil Nadu.

RESEARCH CO-GUIDE
Mrs.S. VALARMATHI _____
M.Sc., M.Phil.,
Researcher officer (statistics)
Department of Epidemiology,
Tamil Nadu Dr. M.G.R. Medical University,
Chennai

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LIST OF ABBREVIATIONS

BMI	-	Body Mass Index
GDM	-	Gestational Diabetes Mellitus
HOD	-	Head Of the Department
ICCR	-	International Centre for Collaborative Research
IUD	-	Intra Uterine Death
IUGR	-	Intra Uterine Growth Retardation
LGA	-	Large for Gestational Age
NICHD	-	National Institute Of Child Health and Human Development
NICU	-	Neonatal Intensive Care Unit
OR	-	Odds Ratio
PIH	-	Pregnancy Induced Hypertension
RR	-	Risk Ratio
SGA	-	Small for Gestational Age
WHO	-	World Health Organization

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Abstract

The effect of maternal life style factors on pregnancy complications and perinatal outcome.

Aims and objective: To assess the effect of maternal lifestyle factors on pregnancy complication and perinatal outcome. **Methodology:** The Research design was meta-analysis. 14 studies were selected for the statistical analysis using the selection criteria. The statistical data was collected and condensed depending on the factors identified from the meta-synthesis. The data was analyzed using the forest plot method. **Results:** The findings of the study revealed that maternal lifestyle factors like pre pregnancy BMI >25kg/m^2, maternal age had the statistical and clinical significance with the RR>1. The other factors identified by meta-synthesis were poor dietary factors and lack of physical activity. The adverse outcome of pregnancy complications like GDM, PIH, anemia were prolonged labor, premature delivery, maternal mortality, IUD, IUGR, low birth weight, low Apgar score<5 with RR>1 and narrow confidence limit. Other maternal and fetal outcomes identified from meta-synthesis are SGA, LGA, birth asphyxia, still birth, congenital anomalies, and increased rate of admission to ICU. **Conclusion:** The result revealed that there was a significant association of maternal life style factors on complications like GDM, PIH and anemia and had a significant relation in causing adverse perinatal outcome.

Keywords: *maternal lifestyle factors, pregnancy complications, perinatal outcome*

INTRODUCTION

Pregnancy is a unique, exciting and often joyous time in a woman's life, as it highlights the woman's amazing creative and nurturing powers while providing a bridge to the future. Pregnancy comes with some cost, however, for a pregnant woman needs also to be a responsible woman so as to best support the health of her future child. Consequently, pregnant women must take steps to remain as healthy and well-nourished.

Lifestyle can affect the health of the future baby, even prior to conception. Because developing baby will entirely depend on their mother’s body for nourishment and protection, it is wise to alter a women’s lifestyle prior to conception so that she can eliminate any bad habits or risk factors that might compromise her health during pregnancy.

Some women experience health problems during pregnancy. These complications can involve the mother’s health, the fetus, or both. Even women who were healthy before

getting pregnant can also experience complication. These complications can make the pregnancy a high risk pregnancy. Some common complications of pregnancy include high blood pressure, gestational diabetes, pre eclampsia and preterm labor (National Institute of Child health and Human Development, 2013).

Objective

To assess the effect of maternal lifestyle factors on pregnancy complication and perinatal outcome.

METHODOLOGY

Research design: Meta-analysis method

Search strategies: studies were taken from Google scholar, Pub-Med, Scope-Med, and various other published journals.

Study selection:

1. Studies conducted and published during the period of January 2004 to December2014.
2. Studies conducted in any of the following design like randomized control trials, prospective, cohort studies and retrospective studies.
3. Each of the study should include the components of the main study.

Data extraction

The data was extracted and condensed with its statistical values along with the title of the study, year, nature of the sample and the size with the geographical area in a tabular form. Despite all these efforts there were several gaps in the data set.

Data synthesis

Pooling of data is done in the stage by using the statistical methods. Most often pooling of the Odds ratio or Relative risk ratio and 95% confidence limit is done. These results were summarized using the forest plot method.

RESULTS

Meta-synthesis results revealed the association between various life style factors for pregnancy complications. The lifestyle factors identified were pre pregnancy BMI>25kg/m^2, pregnancy weight gain >7 kg (OR: 2.594), poor dietary pattern (caffeine and tea intake and vitamin D intake) and physical activity. The other risk factors for the pregnancy complications apart from life style factorswere history of malaria, hematinic compliance, maternal age, parity.

The labor outcome was classified under maternal and fetal outcome. The major maternal outcome identified was preterm delivery, pre mature rupture of membrane, cesarean section, post-partum hemorrhage, abortion, induction of labor, prolonged labor, instrumental delivery and perinatal mortality. The fetal outcome were small for gestational age, congenital anomalies, low birth weight, large for gestational age >4 kg, still birth, respiratory distress syndrome, preterm babies, intra uterine growth retardation, low Apgar score less than 5 at 1 min and birth asphyxia.

The meta-analysis study identified increased body mass index as a major maternal life style risk factors for pregnancy complications with a relative risk of 1.12, 4.627, 1.13.The maternal outcomeidentified from the analysis were maternal mortality (RR: 3.2, 3.5), prolonged labor (RR:6.6) and premature delivery (RR: 1.9) in which the maternal mortality was statistically significant but found to be clinically non-significant. The fetal outcome identified was low Apgar score, intra uterine growth retardation, low birth weight and intra uterine death.

DISCUSSION

There was a significant association between the maternal life style factors for the occurrence of pregnancy complication and had adverse effect on perinatal outcome.

IMPLICATIONS

Midwives practicing in the clinical area have the good opportunity to educate the women regarding the effect of lifestyle risk factors like physical activity, dietary pattern, pre pregnancy BMI, and weight gain during pregnancy on pregnancy complication and its adverse maternal and fetal outcomes. The students should be encouraged to apply the

findings of this study in their specialized clinical areas for the quality nursing practice. The findings of the study will act as a catalyst to carry out more extensive qualitative focused and cost effective research in prevention of pregnancy complications.

INTRODUCTION

Pregnancy is a unique, exciting and often joyous time in a woman's life, as it highlights the woman's amazing creative and nurturing powers while providing a bridge to the future. Pregnancy comes with some cost, however, for a pregnant woman needs also to be a responsible woman so as to best support the health of her future child. Consequently, pregnant women must take steps to remain as healthy and well-nourished.

Lifestyle can affect the health of the future baby, even prior to conception. Because developing baby will entirely depend on their mother's body for nourishment and protection, it is wise to alter a women's lifestyle prior to conception so that she can eliminate any bad habits or risk factors that might compromise her health during pregnancy.

Some women experience health problems during pregnancy. These complications can involve the mother's health, the fetus, or both. Even women who were healthy before getting pregnant can also experience complication. These complications can make the pregnancy a high risk pregnancy. Some common complications of pregnancy include high blood pressure, gestational diabetes, pre eclampsia and preterm labor **(National Institute of Child health and Human Development,2013).**

Anemia in pregnancy is defined by World Health Organization (**WHO**) as a hemoglobin concentration below 11g/dl. It continues to be a major health problem in many developing countries and is associated with increased rates of maternal and perinatal mortality, premature delivery, low birth weight, and other adverse outcomes. More than half of the pregnant women in the world have hemoglobin levels indicative of anemia. The most common cause of anemia in pregnancy worldwide is iron deficiency. Because anemia is the most frequent maternal complication of pregnancy, antenatal care should therefore be concerned with its early detection and management.

High blood pressure that starts after 20 weeks of pregnancy is known as gestational hypertension. Approximately 8 out of every 100 pregnant women will have some form of hypertension during pregnancy. Gestational hypertension can be dangerous for both

mother and the baby. According to **Centre for Disease Control and Prevention (2009)** says more than 4% of pregnant women develop this condition during their pregnancy. If the systolic blood pressure is consistently equal to or higher than 140 or if the diastolic pressure is consistently equal to or higher than 90 then the condition can be said as hypertension. Condition where the mother is having high blood pressure with high levels of proteins in the urine is called pre-eclampsia. When pre-eclampsia is complicated with seizures is called eclampsia.\

Gestational Diabetes Mellitus(GDM) is defined as carbohydrate intolerance that beginsor is the first recognized during pregnancy. Although pregnancy is a carbohydrate intolerant state, gestational diabetes developed in only a small proportion of pregnant women (3-5%). As pregnancy advances, the increasing tissue resistance to insulin creates a demand for more insulin. In the great majority of pregnancies, the demand is readily met, so the balance between insulin resistance and the insulin supply is maintained. However, if the resistance becomes dominant the women become hyperglycemic. This usually occurs in the last half of the pregnancy, with insulin resistance increasing progressively until delivery, when in most cases it rapidly disappears.

GDM complicates from one up to seven percent of all pregnancies and is associated with an increased risk of caesarean delivery, intra uterine fetal death, fetal macrosomia, hypoglycemia and jaundice **(American Diabetes Association).** Pregnancy induced hypertension (PIH) are associated with an increased risk of maternal and perinatal morbidity and mortality and complicate four up to nine percent of all pregnancies.

1.1 BACKGROUND OF THE STUDY

The fifth goal of United Nations 'Millennium Development Goals' for 2015 is to reduce the maternal mortality rates by three fourths. This is because about 350,000women die every year from pregnancy related causes Globally. The maternal mortality ratio had decreased Globally by around 45% between 1990 and 2013. Although large, this rate of decrease is unlikely to lead to the achievement of the targeted 75% reduction by 2015 **(WHO).**

Maternal mortality is unacceptably high, about 800 women die from pregnancy or childbirth related complications around the world every day. In 2013, 2,89,000 women died during and following pregnancy and childbirth. Almost all of these deaths occurred in low resource settings, and most could have been prevented. The maternal mortality ratio in the developed countries in 2013 is 230 per 1,00,000 live birth versus 16 per 1,00,000 live births in developed countries.**(World Health Organization 2014)**.

Indian scenario of maternal mortality rates is about 200 deaths per 1,00,000 live births in 2010 the state of Tamil Nadu in the South East India shows a maternal mortality rates of 63 deaths per 1,00,000 live births

Anemia is the most common nutritional deficiency disorder in the World. **WHO** has estimated that the prevalence of anemia in developed and developing countries in pregnant women is 14 percent in developed countries and 51 percent in developing countries and 65-75% in India.

According to Federation of Obstetrics and Gynecology Societies of India(**FOGSI)** and **WHO** study on maternal mortality revealed that 64.4% of women who died had hemoglobin of less than 8gm% and 21.6% had hemoglobin less than 5gm%.

Prevalence of anemia in India is among the highest in the world. Prevalence of anemia is higher among pregnant women. In India, anemia is directly or indirectly responsible for 40% of maternal deaths. There is 8-10 fold increase in MMR when the Hemoglobin falls below 5g/dl.

Pregnancy Induced Hypertension (PIH) is a leading cause of maternal and perinatal mortality and can also lead to long term health problems like chronic hypertension, kidney failure or nervous system disorders. Approximately 10-15% of maternal deaths in low and middle income countries is associated with PIH.WHO estimates that at least one women dies every seven minutes from complications of hypertensive disorders of pregnancy.

According to **Indian Council for Medical Research (ICMR)** studies shows that PIH is seen in approximately 10-20% of all pregnant women in India

A study conducted in the India shows that the overall prevalence of hypertensive disorder in pregnancy in India was 7.8%. The prevalence of pre eclampsia, gestational hypertension, chronic hypertension and eclampsia were 5.6%, 1.5%, 0.15%and 0.60% respectively. **(International Journal of Pharmasciences and Research,2014).**

A National cross sectional study reveals that almost similar prevalence for pre eclampsia was found in rural (56.2%) and urban (54%) in India, though high rates (70%) were observed in the states of Uttarakhand, Bihar, Jharkhand, Kerala with the highest being in Tripura(87.5%).

The prevalence of GDM in India varied from 3.8 to 21% in different parts of the country, depending on the geographical locations and the diagnostic methods used.GDM has been found to be more prevalent in urban areas than in the rural areas.In India it is difficult to predict a uniform prevalence levels because of wide difference in the living conditions, socio economic levels and dietary habits

In a study conducted in Tamil Nadu, GDM was detected in 17.8 percent women in urban, 13.8 percent women in the semi urban and 9.9 percent women in the rural areas.

1.2 SIGNIFICANCE AND NEED FOR THE STUDY

Pregnancy is the time of joy and excitement. Even though pregnancy gives pleasure and makes feels proud, it puts the mother on pressure. The process of becoming a mother is described as a process of appreciation, discovery, learning and acceptance of the women's new role, which results in a positive and worthwhile experience.(Martell,2011).

Pregnancy complications are complications that occur during pregnancy. They may affect the woman, the fetus or both and may not occur at different times during pregnancy. Complications in pregnancy can result from conditions that are specifically linked to the pregnant state as well as conditions that are commonly arise or occur incidentally in women who are pregnant. Serious sequelae might include miscarriage, pre term labor or pre mature rupture of membrane, stillbirth, low birth weight, macrosomia, birth defects, and maternal and infant mortality and death. Complications affecting mother and fetus may arise at any stage of pregnancy, during labor, and postpartum.

Mutsaers, M.A. (2014) conducted a population based birth cohort study on effects of paternal and maternal life style factors on pregnancy complications and perinatal outcome. all pregnant women in the Dutch province of Drenthe with an expected date of delivery between April 2006 to April 2007 were invited to participate in the study. The study results shows that of all 2264 women 241 women(10.6%) developed hypertensive pregnancy complication 50 women (2.2%) developed GDM, 79(3.5%) children were spontaneously delivered pre term and 155 children (6.8%) were small for gestational age. The study results shows that all the paternal and maternal life style factors were positively correlated and the multivariable analysis showed that paternal lifestyle did not have an independent influence on the investigated outcome.

Luo, B., & Ma, X. (2013)conducted a case control study among obstetrical patients to explore the risk factors of preeclampsia and provide information for prevention of preeclampsia. The risk factors for pregnant women were older gestational age, increasing body mass index, living in country side or small towns, fewer antenatal visits. So the researcher concluded that the health education should emphasized to encourage women to have children at relatively young age and control weight during pregnancy and special care should be taken to improve the living condition and life style modifications.

Guzman J.W., Avila-Esparza.M., Contreras-Solis R.E., Levario C.M. (2012) Have conducted a case control study on factors associated with gestational hypertension and preeclampsia. the researcher included women who have completed pregnancy without complications (n=260) and were diagnosed with gestational hypertension (n=65) and preeclampsia(n=65). The study concluded that there are similarities in the risk factors like maternal age over 35 years, previous gestational hypertension, and first time pregnancy for the development of gestational hypertension and preeclampsia.

Liu C.M. (2008) conducted a retrospective case control study on maternal complication and perinatal outcome associated with gestational hypertension and severe preeclampsia. The study result shows that women with severe preeclampsia had an increased risk of intrauterine growth restriction. Researcher concluded that proteinuria may play a role in the progression of gestational hypertension to severe forms of

preeclampsia associated with subsequent maternal complications and extremely low birth weight babies.

Perumal .V.(2014) have conducted a study to assess the reproductive risk factors for anemia among pregnant women in urban and rural areas of India. Anemia prevalence was assessed among 3355 pregnant women from rural areas and 1962 pregnant women from urban areas. Moderate to severe anemia in rural areas (32.4%) is significantly more common than in the urban areas(27.3%). The study concluded that in the rural areas, various reproductive factors and lifestyle characteristics constitute significant risk factors for moderate to severe anemia

Kalaivani K.(2009) conducted a study to assess the prevalence and consequences of anemia in pregnancy. Inadequate dietary iron, folate intake due to low vegetable consumption, perhaps low B12 intake and poor bioavailability of dietary iron from the fiber, phytate rich Indian diets are the major factors responsible for high prevalence of anemia. Maternal anemia is associated with poor intrauterine growth and increased risk of preterm births and low birth weight babies. This in turn results in higher perinatal morbidity and mortality, and higher infant mortality rate.

Kalyani K.R. et.al(2014) conducted a study in 300 antenatal women to assess the prevalence of gestational diabetes mellitus, its associated risk factors and pregnancy outcomes. the study results shows that prevalence of GDM was found to be 8.33%. Gestational diabetes mellitus was found to be significantly associated with age, parity, BMI, socio economic status, educational level and was also found to be associated with adverse pregnancy outcomes.

The investigator during her clinical experience in the antenatal area witnessed the challenges in complications like GDM, PIH, and anemia in pregnancy due to which the rate of cesarean section was higher. If any of these complications is present during pregnancy either to the mother or to the fetus. However, it is always a challenge for means to relate risk factors to pregnancy outcome. There are many independent research studies on individual complications but there is not much evidenced information on all high risk complications which is associated to risk factors. In western countries, nurses have under

taken many meta-analytical study to relate life style factors to pregnancy outcome and fetal outcome hence as an initial effort in a small scale the investigator had undertaken the present meta-analytic study on effect of maternal life style factors on pregnancy complication and perinatal outcome.

Hence the investigator developed the research concepts in such a way that the prevention of the pregnancy complication can be done by the health care personnel in reducing the perinatal mortality and morbidity.

The purpose of the meta-analysis is to develop a more correct estimate of effect magnitude of the research problem hence the researcher had adopted the meta-analysis design to assess the effect of maternal life style factors on pregnancy complications among the antenatal mothers who had developed the pregnancy complications.

1.3STATEMENT OF THE PROBLEM

A meta-analysis study to assess the effect of maternal life style factors on pregnancy complication and perinatal outcome.

1.4 PHASES

Phase 1: Systematic review and Meta-analysis

Systematic review is a review that methodically integrates research evidence about a specific research question using carefully developed sampling and data collection procedure that are spelled out in advanced in a protocol. The reviewers use methodological procedures that are for the most part , reproducible and verifiable.

A meta-analysis is a statistical approach to combine the data derived from a systematic review.

Phase 2: Meta synthesis

Meta syntheses is a systematic approach to reviewing and integrating findings from completed studies

Phase 3: Integrated review

The integrative review is the methodology that provides synthesis of knowledge and applicability of results of significant studies to practice

1.5 OBJECTIVES

1. To assess the maternal life style factors complicating pregnancy
2. To correlate the maternal life style factors with pregnancy complication and perinatal outcome.

1.6 OPERATIONAL DEFINITION

1.6.1 Maternal life style factor

It refers to the set of habits like dietary pattern, physical activity and increased BMI which can cause pregnancy complications.

1.6.2 Pregnancy complication

It refers to the problems that occur due to some modifiable factors during child bearing periodwhich includes gestational diabetes mellitus, pregnancy induced hypertension and anemia.

1.6.3 Perinatal outcome

It refers to the maternal and fetal consequences caused by the maternal habits and pregnancy complications during labor and one hour after delivery. The maternal consequences includes preterm delivery, prolonged labor and maternal mortality whereas fetal consequences includes small for gestational age, low Apgar score, intra uterine growth retardation, and intra uterine death.

1.7 ASSUMPTIONS

1. The maternal life style factors have an effect on pregnancy complication
2. The maternal life style factors and pregnancy complication have an effect on adverse perinatal outcome

1.8 HYPOTHESIS

There is a significant relationship of life style factors with pregnancy complication and perinatal outcome.

1.9 CONCEPTUAL FRAMEWORK

A conceptual framework or model refers to interrelated concepts or abstractions assembled together in a rational scheme by virtue of their relevance to a common theme that structure or offer a framework for conducting research.

The researcher has adopted **Grounded Theory of Glaser and Strauss with action research.**

The grounded theory method is an inductive approach involving a systematic set of procedure to arrive at theory about basic social processes. The purpose of grounded theory, as the name implies, is to generate a theory from the data. Grounded theory emphasized the process of theory generation from systematically collected and analyzed data.

According to Glaser and Strauss, the Grounded theory approach is designed to enable the researcher for constant comparison of collected and coded data and to formulate proposition.

Action research is a process of gaining information about the situation through a deliberate process of making explicit assumption about how and why things work and planning to improve the act.

The investigator comprised these two models to prepare a proposition by assessing the maternal life style factors on pregnancy complication and perinatal outcome. The components of Grounded theory are as follows:

Data generation

Data generation refers to the collection of data. Data collection can be done by reviewing the previous literatures from 2004-2014. Here the researcher had reviewed the literature related to risk factors of pregnancy complications like gestational diabetes mellitus, pregnancy induced hypertension and anemia in pregnancy and reviews related to perinatal outcome of the pregnancy complications.

Concept formation

Concept formation refers to the collection, coding and analysis of the data from the beginning that was gathered. The researchers concept was to assess the maternal life style factors on pregnancy complications and to rule out the perinatal outcome and thereby deriving the results from all randomized control studies, prospective and cohort studies.

Concept development

Concept development involves steps which describes the images of phenomena and the need for proposition. Through this process the core variable emerges. The concept of core variable refers to a category which accounts for most of the variation in a pattern of behavior and which helps to integrate other categories that have being discovered in the data.

CONTEXT: ScopeMed, PubMed, Google scholar, published articles

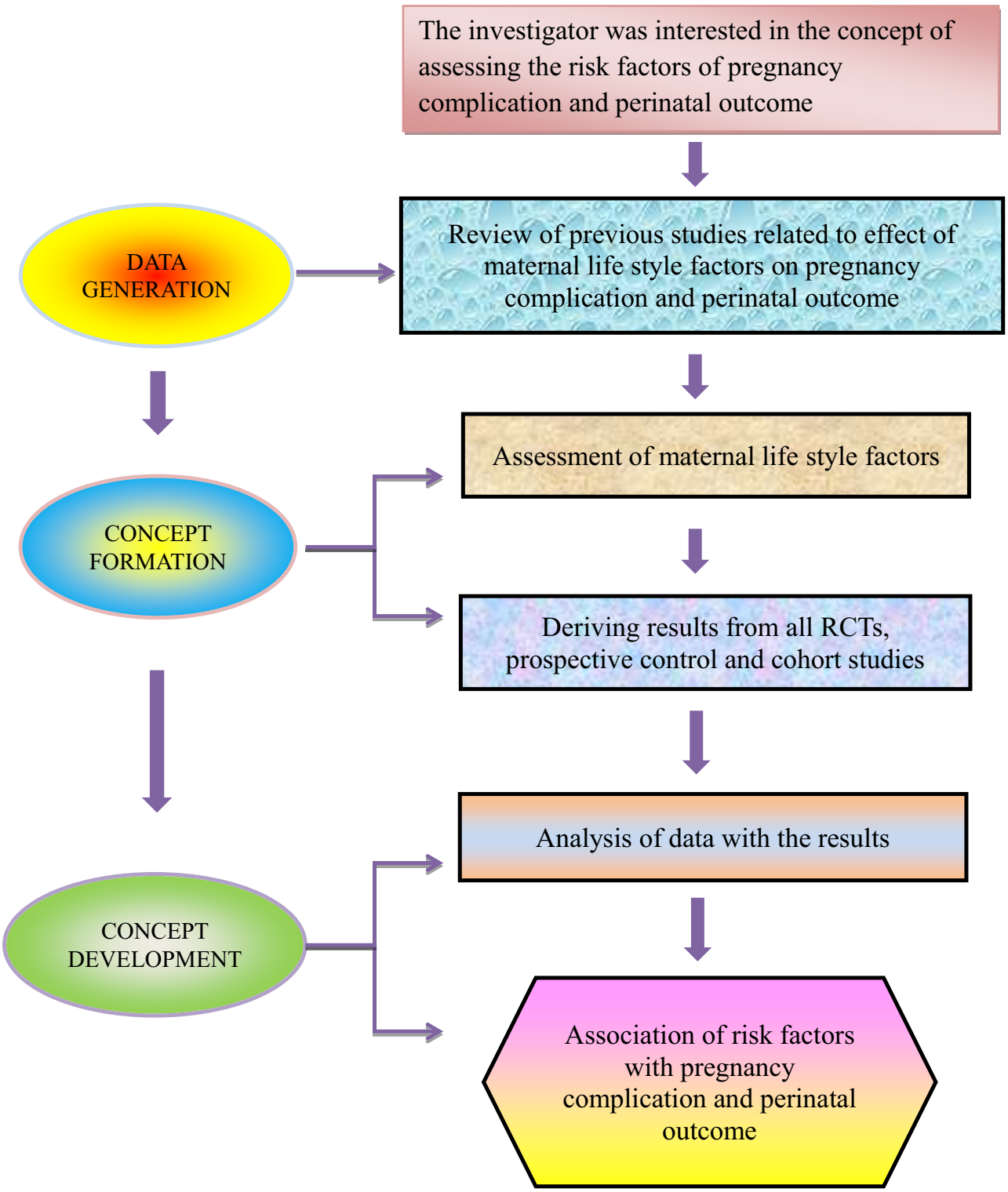

FIG 1.9.1: CONCEPTUAL FRAMEWORK BASED ON GROUNDED THEORY OF GLASER AND STRAUSS

1.10 OUTLINE OF THE REPORT

Chapter 1 : Dealt with introduction, background of the study, need for the study, statement of the problem, phases, objectives, operational definition, hypothesis, and conceptual framework.

Chapter 2 : Contains the systematic review and meta-analysis of the primary studies.

Chapter 3 : Presents the methodology of the study and plan for data analysis.

Chapter 4 : Focuses on data analysis and interpretation.

Chapter 5 : Enumerates the discussion and findings of the study.

Chapter 6 : Consist of summary, conclusion, implications, recommendations and limitations of the study

METASYNTHESIS

This chapter deals with the extensive review of the 14 selected literature which aids to generate a complete picture about the research question.

Qualitative Meta synthesis is an intentional and coherent approach to analyzing data across qualitative studies. It is a process that enables researchers to identify a specific research question and then search for, select, appraise, summarize and combine qualitative evidence to address the research question.

A Meta synthesis is a systematic approach to reviewing and integrating finding s from completed studies. AMeta synthesis is from a qualitative meta-analysis.The goal of Meta synthesis is to produce a new and integrative interpretation of the findings that is more substantive than those resulting from individual investigations.

An extensive review of literature was done by the investigator with the key words of risk factors of anemia in pregnancy, gestational diabetes mellitus and pregnancy induced hypertension, maternal and fetal outcome of anemia in pregnancy , gestational diabetes mellitus, pregnancy induced hypertension and life style risk factors of pregnancy complications to gain an insight into the problem, collect maximum information from systematic and critical review of scholarly publications, unpublished scholarly print materials.

The detailed description of the 14 primary studies is with its supportive studies is as follows:

Monika Malhotra, Sharma J.B, Batra .S, Sharma .S, Murthy .N.S, Arora .R (2004) conducted a study on maternal and perinatal outcome in varying degree of anemia among 447 pregnant women. On the basis of hemoglobin level mothers were grouped into four categories like a group of women with hemoglobin >11 g/dl, mild, moderate and severe anemia respectively. The study results shows that the mean age of women was 27.06 ± 4.25 years and maximum mean age was found to be in the severe group. The difference in the age groups between group I and IV was found to be statistically significant. Maximum mean parity was found in women in group IV (3.09 ± 1.5) and the

lowest in group I women with normal hemoglobin (1.7 ± 0.9) and the difference between two groups is statistically significant.

The pregnancy complication that occurred as a result of anemia was pre eclampsia and the difference in the prevalence of pre eclampsia was found to be statistically significant in all the groups compared to group IV. There was one case of eclampsia associated with hemoglobin more than 11g/dl. The common maternal outcomes identified from the study are the induction of labor, prolonged labor, cesarean section, instrumental delivery and post-Partum hemorrhage with or without blood transfusion. Of the above mentioned maternal outcomes the statistically significant were prolonged labor. The rates of cesarean section were increasing with the severity of anemia but the difference in the rate of cesarean section between the four groups didn't attain a statistical significant value.

The fetal outcome identified were pre term babies, low birth weight, intra uterine growth retardation, low Apgar score of less than 8, birth asphyxia and infectious complications. The low birth weight difference in the groups in comparison with the group IV shows a statistically significant value with further analysis there is a 10.5 fold increased risk of having a low birth weight babies in women with hemoglobin ≤7.5g/dl. Intra uterine growth retardation found to be statistically significant when compared within the groups. The proportion of women with babies showing Apgar score of less than 8 was higher in severely anemic mothers but in comparison within the group it showed non significance. Therefore statistically significant fetal outcome are low birth weight and intra uterine growth retardation.

The above data was consistent with an epidemiological study conducted by **Leon.G.B.Set.al (2014),** on characteristics of severely anemic pregnant women and its perinatal outcome in Banfora regional hospital among 283 pregnant anemic mother. Among the 283 cases deliveries occurred on 22.6%, abortion in 1%. From the 64 deliveries 45.3% were alive preterm birth, 20.3% were preterm still birth, 25% at term birth, 9.4% at term still birth. among 45 alive babies 91% were low birth weight. Thus the study concluded that severe anemia during pregnancy results in maternal mortality, preterm, low birth weight and still birth even between hospitalized women.

Lone F.W, Qureshi .R.N, Emmanuel .F (2004)conducted a cohort study on maternal anemia and its impact on perinatal outcome among the 629 pregnant women attending the obstetrics department of the Aga Khan university hospital. The samples were divided into two groups as exposed group and unexposed group. Data was collected with a pre designed questionnaire and by interview method. The study result shows that the mean maternal age was 26.85 ± 4.77 in anemic group. The risk of pre-term delivery was four times higher among the anemic mothers with a statistical significant association (95% confidential limit is 2.5 – 6.3) and also there was 2.2 times and 1.9 times increased risk of low birth weight (LBW) and intra uterine growth restriction (IUGR) respectively in the exposed group. Even though perinatal mortality was greater among anemic women but it was statistically non-significant. The risk of an Apgar score ≤ 5 at the first minute and ≤ 7 at fifth minute was greater than that of the non-anemic group. Intra uterine death was statistically not significant but had higher rate in the anemic group compared to non-anemic mothers.

Thus the study concluded that the pregnancy outcomes varies according to the type of anemia like iron deficiency anemia and physiological anemia in pregnancy. Maternal hemoglobin values during the pregnancy are associated with negative birth outcome like low birth weight and preterm.

The above described primary study was supported by the researcher **Ram HariGhimire, Sita Ghimire (2013)** by a retrospective cohort study to explore the association between anemia and maternal and perinatal outcome among 100 severely anemic against 100 non anemic women in Nobel Medical college teaching hospital, Nepal. The study results shows that there is an increased risk of pregnancy induced hypertension with an odds ratio of 5.06 in anemic women. Post-partum hemorrhage, incidence of wound infection, intermediate care unit admission was statistically significant in the exposed group. Apgar score <7 in 5 minutes was 18% in exposed group whereas in non-exposed group it was 5%. The rate of intra uterine death was 6% in case group. Frequency of low birth weight was 22% in exposed group and 9% in non-exposed group.

Umber JalilBakhtiar, Yasmeen, Khan, RaziaNasar (2007) conducted a study on relationship between maternal hemoglobin and perinatal outcome among 860 patients where 402 were anemic. The study shows that the mean maternal age of the study participants were 25.85. Results revealed that the risk of preterm deliveries was 3.4 times greater in anemic women than the non-anemic women whereas the risk of low birth weight and intra uterine growth retardation was found to be 1.8 and 1.7 times greater in anemic mothers than in non- anemic mothers. Perinatal mortality was 3.5 times greater when compared with non-anemic women. Other fetal outcomes like low Apgar score at 1min and intra uterine fetal death and perinatal mortality was also showed increased ratio in the anemic group.

Thus the study data showed association of maternal anemia in pregnancy with increased risk of delivery of premature and LBW babies, intra uterine death and low Apgar score at one minute. The death was found to be due to prematurity and sepsis. Other nutritional deficiencies can also cause adverse maternal and perinatal outcome.

Sangeetha .V.B, Pushpalatha (2014) had conducted a prospective case control study on severe maternal anemia and neonatal outcome among 200 pregnant women at third trimester conducted at the Vani Vilas hospital, Bangalore, Karnataka. The mean age of the study participants were 22.81±2.79 in anemic group and non-anemic group was 23.49±2.58. The study shows that there is a direct relationship between hemoglobin percentage and birth weight of the babies that is the mean birth weight increased from 1567.67g at hemoglobin level 3.0 – 4.5g% to 2991.67 g at hemoglobin level greater than 13g%. The risk of preterm delivery was statistically significant with an odds ratio of 1.7 and shows clinical significance of 95%confidence limit of 1.3 – 2.1. There was 2.8 times increased risk of low birth weight among the case group (95% CI: 2.1 – 3.8 and double fold increased risk among anemic women of giving birth to intra uterine growth retarded babies (95% CI: 1.6 – 2.4). The risk of Apgar score less than 5 at 1 min was 1.6 times and intra uterine death was increased by 1.8 times when compared with the non-anemic group

The study concluded that severe maternal anemia definitely has a very poor outcome on the new born in terms of low birth weight, prematurity, intra uterine growth retardation, intra uterine death, and birth asphyxia.

The above studies was consistent with the study conducted a population based study by **Lisa .G. Smithers, Angela.G, Wendy S, Sally Brinkman, John . W. Lynch (2014)** on anemia of pregnancy, perinatal outcomes and children's developmental vulnerability among all live births in the state of south Australia. Perinatal outcomes were recorded by midwives using a validated standardized form. The study results show that 8764 anemic cases were reported from 124061 total cases. Anemia in pregnancy was associated with a higher risk of fetal distress (incidence rate ratio: 1.20) and preterm birth <37 weeks of gestation (IRR: 1.23), newborns were less likely to require resuscitation (IRR: 0.94). Thus the study concluded that anemia in pregnancy was associated with perinatal complications.

The above outcome is also supported by **Toral .M. Goswami et.al (2014)** by a study on maternal anemia during pregnancy and its impact on perinatal outcome among 105 pregnant women in B.J Medical College, Ahmadabad. The study results show that the prevalence of anemia among pregnant women was 71.43%. The analysis suggest that birth weight has direct correlation with prevalence of anemia and association is statistically significant in all trimester The study concluded that the maternal anemia in pregnancy can results in low birth weight subsequent to preterm delivery.

MeseretAlem et.al (2013) had conducted a cross sectional study on prevalence of anemia and associated risk factors among 384 pregnant women in Northwest Ethiopia. Among 384 participants the prevalence of anemia was 83(21.6%). Among the total anemic women attended the clinic, majority of them were having mild anemia (49%) followed by 46% cases were moderately anemic and the remaining 5% were severely anemic. Anemia was significantly associated with age group ranged from 26-34 years in which the odds ratio is 2.21 with 95% confidence limit of 1.24- 3.96.

The study results revealed that the anemia was significantly associated with the history of malarial attack and other infections with hookworm, ascarislumbricoides, giardia intestinalis, and entamoebahistolytica. History of malarial attack shows a high statistical significance with an odds ratio of 13.28 and 95% CI: 3.5-49.72. Thus the study concluded that the overall prevalence of anemia in pregnancy among the study population

was low. Socio demographic variables like maternal age, economic status, parasitic infection and lack of iron supplements contributes to maternal anemia.

The above mentioned study result was supported by **ZeinaMakhoul et.al(2012)** who had conducted a study on risk factors associated with anemia, iron deficiency and iron deficiency anemia in rural Nepali pregnant women. Data has been collected from 3531 pregnant women. Factors associated with severe anemia and poor iron status were determined using logistic regression. Hookworm infection has increased the risk for developing severe anemia (AOR:4.26, $p<0.01$) and iron deficiency anemia(RRR: 2.18, $p<0.05$). Dietary heme iron was significantly associated with iron deficiency without anemia (RR: 0.1, $p<0.01$). The study results concluded that the risk factors varied by classification and multiple approaches are needed to reduce anemia and associated nutrient deficiencies.

Rosmawati N.H, MohdNazri, Mohd Ismail (2012) conducted a cross sectional study on the rate and risk factors for anemia among 47 pregnant mothers. Data collection was done using a structured study questionnaire. Among the 47 participants 57.4% was anemic and the mean age of pregnant women was 28.3 years. The rate of anemia was higher in grand multiparas specially those at the third trimester. The result of multiple logistic regression shows that there was a significant association of hematinic compliance with anemia with an odds ratio of 4.571.

Below mentioned are the few other studies which shows the significant association of certain maternal factors on causing anemia in pregnancy.

Naila B.A et.al (2014) had conducted a study on anemia prevalence and risk factors in pregnant women in an urban community setting in Hyderabad, Pakistan. The total sample size was about 1369 pregnant women enrolled at 20 to 26 weeks of gestation and followed to 6 weeks of post partum. The study results shows that the prevalence of anemia in the selected samples were 90.5% of these 75.0% had mild anemia and 14.8% had moderate anemia and about 0.7% were only severely anemic. The analysis reveals that drinking more than three cups of tea per day before pregnancy(adjusted prevalence odds ratio3.2, 95% CI: 1.3-8.0), pica(APOR:3.7 95% CI: 1.1-12.3), never consuming eggs or

consuming eggs less than twice a week during pregnancy(APOR:1.7 95% CI:1.1-2.5) were significantly associated with anemia. Consumption of red meat less than twice a week prior to pregnancy was marginally associated with anemia.

Noronha J.A, Bhaduri A, Vinod Bhat H, Kamath A (2010) conducted a prospective retrospective cohort study on maternal risk factors and anemia in pregnancy among 1077 antenatal and 1000 postnatal women in Sultan Qaboos Univerity, Oman. The maternal factors included were age, parity, education, socio economic status, spacing, history of bleeding, worm infestation, period of gestation, food selection ability. The high prevalence was strongly associated with low socio economic status (OR: 1.409 CI:1.048-1.899) which affected their knowledge and health seeking behavior in both the groups.

Fatemeh Mirzaie et.al (2010)conducted a retrospective cross sectional study on prevalence of anemia risk factors among 2213 pregnant women in Kerman, Iran. Overall 104(4.7%) women were anemic. The study shows that multi parity was associated with lower hemoglobin concentration during the second and third trimester of pregnancy (p=0.003). The prevalence of anemia was significantly higher in smokers (p=0.01) and opium users (p=0.003)

Perumal Velamal (2014) had conducted a study on reproductive risk factors assessment for anemia among pregnant women in India using a survey method among women in the reproductive age group of 15-49 yrs. Anemia prevalence was assessed among 3355 pregnant women from rural areas and 1962 pregnant women from urban areas. Data was collected using a structured questionnaire. The study results shows that moderate to severe anemia in rural area is 32.4% whereas in urban is 27.3%. More births in the last five years, alcohol consumption, and smoking habits are the significant risk factors of anemia in pregnancy. In rural areas various reproductive factors and life style characteristics constitute significant risk factors for moderate to severe anemia. Therefore intensive health teaching should be given on reproductive practice and the impact of lifestyle characteristics to reduce anemia prevalence.

Mutsaerts .M.A, et.al (2014) conducted a study on effects of maternal life style factors on pregnancy complication and perinatal outcome among 2264 pregnant mothers and mothers within 6 months of delivery and the outcome data was obtained from

midwives and hospital registers. The study results shows that among 2264 women, about 10.6% (241) women developed hypertensive pregnancy complication and 2.2% (50) women had developed GDM. Of the total deliveries conducted79 (3.5%) children were spontaneously delivered preterm and 155 children (6.8%) were small for gestational age (SGA).Pre pregnancy Body Mass Index (BMI) was independently associated with the increased risk of a hypertensive disorder during pregnancy with an odds ratio of 1.12 and 95% CI of 1.09-1.16 as well as a higher risk of GDM with an odds ratio of 1.13 (95% CI:1.08-1.18). SGA found to be statistically not significant with an odds ratio of 0.94.

Thus the study concluded that the pre pregnancy BMI and weight gain during pregnancy is associated risk factors for causing hypertensive pregnancy complication and gestational diabetes mellitus thereby resulting in spontaneous preterm delivery.

The above findings were also consistent with a prospective non-randomized descriptive study conducted by **Vellanki Venkata Sujatha et.al (2011)** on high body mass index in pregnancy and its effect on maternal and fetal outcome among 200 samples in KIMS, Narketpally.100 women with high BMI were compared with 100 women with normal BMI with regard to antenatal complications, maternal morbidity and neonatal outcome.

The study compared the high BMI women with the normal BMI, the following outcomes like GDM, pre-eclampsia, macrosomia, cesarean section and infections were significantly more common in obese pregnant women (BMI >30). Gestational diabetes mellitus was statistically (OR: 4.8) and clinically significant with the 95% confidence limit of 1.01 – 3.02. Pre eclampsia, cesarean section and macrosomia are both statistically and clinically significant whereas the rate of infections was clinically not significant (0.39 – 7.32) but was statistically significant with OR: 1.7. Thus the study points out a strong association between maternal obesity in early pregnancy and pregnancy complications and threatening complications in the neonatal period.

Helle Margrete M et.al (2011) conducted a cohort study among pregnant women in Norway on effect of dietary factors in pregnancy on risk of pregnancy complication. The study results shows that vegetarian pattern of the dietary habits is not statistically

(OR:0.72, CI: 0.62-0.85) associated with the occurrence of pre-eclampsia whereas processed foods like meat products, snacks and sweet beverages shows a statistical significance with an odds ratio of 1.21 (95% CI: 1.03-1.42) as the risk factor of pre-eclampsia. Vitamin D intake from the diet was very low (median:3.0µg vitamin D /day)among the participants and had no effect on risk of pre eclampsia development. Total intake of 15-20µg of vitamin D per day has decreased the risk of pre eclampsia by 23% and supplementation of 10-15µg vitamin D reduced the risk by 27%. Thus the study concluded that processed food pattern is statistically and clinically significant as a risk factor for the pre eclampsia.

Isabelle G, Roland D, Patrick .M, Greet .V (2010) had conducted a randomized control trial on effect on maternal life style intervention on dietary habits, physical activity, and gestational weight gain in 195 obese pregnant women (age: 29±4, BMI:33.6±4.2). 195 participants were divided into three groups : a group that received nutritional advice from brochure, a second group that received brochure and life style intervention by a nutritionist and a control group. In the control group it is observed that pre pregnancy BMI, dietary intake and decreased physical activity had an influence on pregnancy induced hypertension and pre-eclampsia in which the maternal outcome was induction of labor and cesarean section.

Rachel Bakker (2010) conducted a population based prospective cohort study on caffeine intake and hypertensive complications among 7890 pregnant women. The researcher had examined the association of caffeine intake in different trimesters of pregnancy with repeatedly measured blood pressure and the risks of pregnancy induced hypertension and pre-eclampsia among the study population. In each trimester caffeine intake and blood pressure was assessed using questionnaire and physical examination. The higher caffeine intake tended to have a significant association with higher systolic blood pressure in the first and third trimester (p=0.05). Caffeine intake was not associated with the diastolic blood pressure levels or the risk of pregnancy induced hypertension. Higher caffeine intake during pregnancy seems to be associated with elevated systolic blood pressure levels in first and third trimester.

The above described 3 studies were consistent with the study conducted by the author **Vineetha Singh, Manushi Srinivastava (2015)** had conducted a cross sectional study to assess the associated risk factors with pregnancy induced hypertension. The study was carried out in 82 pregnant women between the age group of 15-49 years, who attended the antenatal clinic of Sir Sundar Lal Hospital, Varanasi. Data was collected using a semi-structured interview schedules containing precoded questions. The study revealed that the reason behind high blood pressure is lack of exercise (31.71%), high salt in diet (15.85%), stressful life (15.85%). Researcher concluded that the overall incidence of eclampsia is 13.58% in the study population regarding PIH. Lack of exercise is a major cause of hypertension.

Mulualem E, FekaduA, Amanu A, Asrat .A (2014) conducted a case control study on effect of maternal nutrition and dietary habits on pre-eclampsia among 453 pregnant women (151 cases and 302 controls). The study results shows that women having mid upper arm circumference (MUAC) ≥25.6cm were two times more likely than their counterparts to have pre-eclampsia (AOR: 2.49, 95% CI:1.58-3.94). The preeclampsia odds ratio was found to be higher in women who have taken coffee during pregnancy (AOR:2.16, 95% CI:1.32-3.53). Also women who had anemia during the first trimester pregnancy were three times prone to have the incidence of pre eclampsia (AOR: 2.80. 95% CI: 1.09-7.21). The study results also revealed that consuming fruits, vegetables and folate supplements during pregnancy had an independent effect on prevention of pre eclampsia. Thus the study concluded that higher MUAC, anemia, coffee intake during pregnancy are the risk factors for the development of pre eclampsia.

Rachel Bakker (2010) conducted a population based cohort study on difference in birth outcome in relation to maternal age among 8568 pregnant women. The researcher examined the associations of maternal age with birth outcomes and explaining the role of socio demographic and lifestyle related determinants. Maternal age was assessed at enrolment. The main outcome measures were birth weight, preterm delivery, small-size for gestational age, and large-size for gestational age. The research results found that as compared to mothers aged 30 to 34.9 years no differences in risk of preterm delivery were found whereas mothers younger than 20 years had the higher risk of having small for gestational age children(OR: 1.6, 95% CI:0.8-2.4).

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Thus the study concluded that as compared to mothers aged of 30 to 34.9 years, younger mothers have increased risk of small-size-for-gestational age children, whereas older mothers have an increased risk of large size for gestational age children.

The above study is supported by a systematic review conducted by **Mary Carolan, Dorota Frankowska (2010)** on advanced maternal age and adverse perinatal outcome. The adverse outcomes assessed were still birth, low birth weight and pre term birth. Evidence from this review suggests that the rates of adverse perinatal outcome such as still birth are linked to maternal age 35-39 years. The study concluded that the risk and rates of adverse perinatal outcome are increased among women aged 35-39 years.

Christina .A.V et.al (2011) conducted a randomized control trial of life style intervention in 360 obese pregnant women. The study objective was to assess the effect of life style intervention on gestational weight gain and obstetric outcome. The intervention program included dietary guidance, physical training and personal coaching. In this study BMI of 35-40 kg/m^2 was a risk factor for the development of pregnancy complication and adverse perinatal outcome. The obstetrical outcomes assessed were cesarean section, GDM, pre eclampsia and the neonatal outcomes were birth weight, gestational age, LGA, birth weight more than 4000g and admission to Neonatal Intensive Care Unit(NICU) where all the outcomes shows statistical significance in analysis. GDM and pre eclampsia had occurred in 8 and 28 women with a 'p' value of 0.760 and 0.506 respectively.

The study results were supported by other studies done by different researchers in different setting.

Mayur R Gandhi et.al(2015)had conducted a prospective study on perinatal outcome in pregnancy induced hypertension in the department of obstetrics and gynecology of GMERS medical college and hospital, Gujarat among 95 pregnant women with PIH. The study results shows that the overall incidence of PIH was 12.8%. Eclampsia was the commonest maternal complication affecting 11.6% cases. Out of 95 births, perinatal death were occurred in 22 (23.15%) cases. Out of 22 perinatal death, 13(61.2%) were still births and 9(42.8%) were neonatal deaths.

Kenny .C.L et.al (2013) had conducted a population based cohort study on advanced maternal age an adverse pregnancy outcome among all singleton births from 2004-2008 at The University of Manchester, UK. The study population were grouped according to their group like 30-34, 35-39, and >40 years and these groups were compared with women aged 20-29. The study findings revealed that women aged more than 40 years were at increased risk of adverse pregnancy outcomes like still birth, preterm, very pre term, macrosomia, extremely large for gestational age and cesarean section. Thus the study concluded that advanced maternal age was associated with a wide range of adverse pregnancy outcome.

Tavassoli Fatemeh (2010) had conducted a descriptive analytic and case control study on maternal and perinatal outcome in nulliparous women complicated with pregnancy hypertension among 100 hypertensive and 100 normotensive nulliparous who were referred to Imam Reza hospital. The results shows that the rate of low birth weight (68.4%), intra uterine growth retardation (27.5%), need for neonatal care unit(17.6%), need for resuscitation(21.6%), neonatal Apgar (23.5%) were higher in the severe preeclampsia. The study concluded that maternal and fetal-neonatal complications mostly appear in pregnancy complicated with induced hypertension especially in severe preeclampsia.

Preethi Wahi et.al (2010) had conducted a prospective study on prevalence of gestational diabetes mellitus and its outcome in Jammu region among 272 antenatal mothers. The maternal and fetal outcomes were recorded and compared with non-diabetic control group and non-interventional untreated GDM group. The study results showed that the overall prevalence of GDM was found to be 6.94%. The observed maternal outcomes were post-partum hemorrhage, pre-mature rupture of membrane, abortion, gestational hypertension, cesarean section, preterm delivery. The assessed fetal outcome includes congenital anomalies, low birth weight, large for gestational age(>4kg), still birth, respiratory distress syndrome and shoulder dystocia.

The described study results are consistent with the below mentioned studies conducted by various researchers in various time period.

Eliana M.W et.al(2012) had conducted a systematic review on Gestational Diabetes and pregnancy outcome using WHO and IADPSG diagnostic criteria. The relevant studies were taken from MEDLINE, EMBASE, CINHAL, WHO-afro library, EMCAT, IMEMR. The study results shows that when using WHO criteria association was seen for macrosomia (RR: 1.81, p<0.001), large for gestational age (RR: 1.53, p<0.001), perinatal mortality (RR:1.55, p<0.13), preeclampsia (RR:1.69,p<0.001), cesarean delivery (RR:1.37, p<0.001). Thus the study concluded that the WHO and IADPSG criteria for GDM identified women at a small increased risk for adverse pregnancy outcomes. Associations were of similar magnitude for both criteria.

Leticia Lara Avila et.al (2012) had conducted a prospective study on effect of carbohydrate intolerance(CHI) and Gestational Diabetes(GD) on obstetric and perinatal outcomes among 182 pregnant women between 16-30 weeks of gestation at the Civil Hospital of Culiacan. The study results shows that there is no significant differences were found between women with CHI and women with GD with respect to obstetric hemorrhage(p=0.774), preeclampsia-eclampsia (p=0.590), and macrosomia (p=0.119). However polyhydramnios was more frequent in CHI group(OR=3) whereas admission to the NICU was higher in GD group(OR=0.38). Thus the study concluded that there is no any significant difference were found between women with CHI AND GD except in case of polyhydramnios and admission to NICU.

Carlos Antonio Negrato, Rosiano Mattar, Marillia B Gomes (2012) had conducted a study on adverse pregnancy outcomes in women with diabetes. On maternal side morbidity and mortality rates are also higher among pregnant women with diabetes. Rates of preeclampsia (12.7%), cesarean section (44.3%), and maternal mortality (0.6%) among women. The most common adverse fetal outcomes found in pregnancies of women with diabetes are fetal and neonatal loss, a great variety of congenital abnormalities and malformations, premature delivery, macrosomia which are associated with several obstetric complications like birth trauma, stillbirth, respiratory distress syndrome, neonatal hypoglycemia and maternal complications like PIH, cesarean section, and hypoglycemia.

Niranjan T et.al (2013) conducted a prospective observational cohort study to assess the perinatal outcome of infants born to mothers with gestational diabetes treated with insulin or oral hypoglycemic agents in a tertiary care perinatal center in southern India. Among 10394 mothers574 were diagnosed to have GDM, 137 were treated with insulin and oral hypoglycemic agents.44(4.7%) babies were born preterm, 97(35%) were LGA, 13(4.7%) were SGA. Hypoglycemia was observed in 26(9.3%) babies, congenital anomalies in 15(5.4%), and birth injuries in 7(2.5%). There was no any significant difference between the two groups in any of the outcome except in hyperbilirubinemia, which was more in insulin group.

Rajesh Jain, Rakesh R Pathak, Adithya A Kotecha (2014) had conducted a prospective study to determine the prevalence of GDM and evaluate the maternal and fetal outcome in and around Kanpur. The study was carried out in 198 healthcare centres 24,656 mothers were screened as per the guidelines of Diabetes in Pregnancy Study Group India(DPSGI) and Federation of Obstetric and Gynecological Societies of India(FOGSI). Prevalence of GDM was around 14.42%. Low birth weight was 35% in GDM whereas in non GDM it is about 16%, still birth, perinatal and neonatal mortality were respectively 2, 3.3 and 6 times higher in GDM respectively. Relative risk for large for gestational age, low birth weight, preeclampsia and jaundice were also higher.

Rajesh Rajput, YogeshYadav, Smiti Nanda, Meena Rajput (2013) had conducted a study on prevalence of GDM and associated risk factors of GDM in a tertiary care hospital in Haryana among 607 antenatal mothers. The prevalence of the GDM among the study participants were 43(7.1%) women. On analysis risk factors found to be significantly associated with GDM were age, educational level, socio-economic status, pre-pregnancy weight and BMI, weight gain, family history of diabetes or hypertension and past history of GDM. The maternal age and BMI >25kg/m^2 , weight gain of more than 7 kg was found to be statistically and clinically significant.

The above given data is consistent with the following studies.

Leng J et.al (2015) had conducted a prospective population based study to assess the prevalence of gestational diabetes mellitus and its risk factors in Chinese pregnant women. The study results shows that the adjusted prevalence of GDM by 1999WHO

criteria was 8.1% whereas according to International Association of Diabetes and Pregnancy Study Group(IADPSG) criteria increased the adjusted prevalence to further to 9.3%. Advanced age, higher pre pregnancy BMI, higher systolic pressure, a family history of diabetes, weight gain during pregnancy, and habitual smoking were the risk factors of GDM. Thus the study concluded that the increased prevalence of overweight or obesity and older age at pregnancy were accompanied by increased prevalence in GDM.

Ewnighi C. et.al (2013) had conducted a study on the prevalence of gestational diabetes mellitus and its risk factors among pregnant women in Abakaliki metropolis, Nigeria. A total of 250 pregnant women aged between 15-44yrs those who are attending the antenatal clinic within the period of June 2010 to December 2011 were taken as samples. The study concluded that the prevalence of GDM in this region was found to be 4.8%. The high value may be linked to malnutrition. This value was found to increase significantly with the increase in the age of the women.

Cuilin Z (2014) have conducted a prospective cohort study on adherence to healthy lifestyle and risk of gestational diabetes mellitus. The objective was to quantify the association between a combination of healthy lifestyle factors before pregnancy (healthy body weight, healthy diet, regular exercise and not smoking) with the risk of gestational diabetes. samples included 20136 singleton live births in 14437 women without any chronic diseases. Researcher concluded that adherence to a low risk lifestyle before pregnancy is associated with a low risk of gestational diabetes and could be an effective strategy for the prevention of GDM.

Geetha Arora. et.al (2014) had conducted a screening program among 5100 randomly selected North Indian women using a cross sectional study design with a structured questionnaire. The study aimed to determine the prevalence and risk factors of GDM using the previous WHO 1999 versus WHO 2013 criteria in North India. The study results shows that the prevalence of GDM was 35% using WHO 2013 criteria versus 9% using WHO 1999 criteria. Independent risk factors of GDM using the 1999 criteria were urban habitat, illiteracy, non vegetarianism, increased BMI, low adult height whereas only urban habitat, low adult height, and increased age were the independent risk factors of GDM using the 2013 criteria.

Velusamy Shivakumar, Ayyalu Rajasekeran, Arumugam Vijayakumar (2014) conducted a study on assessment of risk factors for the early detection of gestational diabetes mellitus among pregnant women who was diagnosed and treated for GDM were taken for the study. The study was carried out in a multispecialty hospital in Tamil Nadu, south India. The study reveals that age, BMI, gravidity, primiparity, and irregular menstrual cycles shows significant influence on the development of GDM. These risk factors are comparable with internationally documented risk factors and identifying those women with these factors is important in the early diagnosis of GDM.

Table 2.1 shows the maternal life style factors of the pregnancy complication like PIH, GDM, and anemia in pregnancy and its adverse maternal and fetal outcome

Pregnancy complications	Life style factors	Maternal outcome	Fetal outcome
GDM	Pre pregnancy BMI□25 kg/^{m2} (OR:1.13, CI:1.08-1.18) Pregnancy Weight gain >7 kg (OR: 2.594)	Preterm delivery Pre eclampsia PROM Cesarean section PPH Abortion Gestational hypertension	SGA Admission in ICU Congenital anomalies LBW LGA(>4 Kg) Still birth RDS Shoulder dystocia >4kg
PIH	Pre pregnancy BMI>25kg/m^2(OR:1.12, CI:1.09-1.16) Dietary pattern (caffeine and tea intake and vitamin D intake) Physical activity	Induction of labor Prolonged labor (OR:2.74) Cesarean section Instrumental delivery PPH Preterm delivery	Preterm Low birth weight IUGR Apgar<8 Birth asphyxia SGA Birth weight > 4000g Admission in ICU
Anemia	Poor dietary intake	Labor induced Cesarean section Perinatal mortality	Premature birth (OR: 1.657, CI:1.283-2.141) Low birth weight (OR IUGR IUD Apgar<5 at 1min

RESEARCH METHODOLOGY

This chapter describes the methodology adopted in this study to assess the effect of maternal life style factors on pregnancy complications and perinatal outcome

This phase of the study included selecting the research design, criteria of eligible studies, search strategies for the primary studies, samples of the study, data extraction from the organized studies, effect size calculation, and plan for statistical analysis

3.1 RESEARCH APPROACH

The research approach used in this study was systematic review approach (Quantitative).

3.2 RESEARCH DESIGN

Meta-analysis method was used to find out the statistical and clinical significance of the study title.

A meta-analysis is a quantitative type of systematic review. It is the mathematical synthesis of the results of two or more primary studies that address the same hypothesis in the same way.

3.3 STUDY SELECTION

3.3.1 Inclusive criteria

A very comprehensive search was been made on the research question. The studies that met all of the following criteria were included in the present meta-analysis.

1. Study conducted and published during the period of January 2004 to December 2014
2. Study\ conducted in any of the following design like randomized control trials, prospective, cohort studies and retrospective studies.

These specific study design was selected because of its purpose and statistical properties. Randomized control trial are often used to test the efficacy or effectiveness of various types of various type of interventions and provide information about adverse

effects. The prospective study watches for outcome such as development of diseases during the study period and relates this to the risk factors or other protective factors. The cohort studies yields true incidence rates and relative risks from a large population. The relative risks are easy to derive and thus the relative risk value is quoted in the prospective studies.

3. The study should have included the components of the main study.
4. Studies which had full text.

3.3.2 Exclusive criteria

1. Studies which had incomplete data regarding the components.
2. Studies which don't have an odds ratio or relative risk value.

3.4 SEARCH STRATEGIES

3.4.1 Database searched

Online databases like Google scholar, Pub med, Scope med, i-search and various other online published journals were searched during the period of November 2014-December 2015 on effect of maternal life style factors on pregnancy complications and perinatal outcomes. Apart from database search efforts were made to search the studies from the university library and college library for unpublished thesis.

3.4.2 Key words

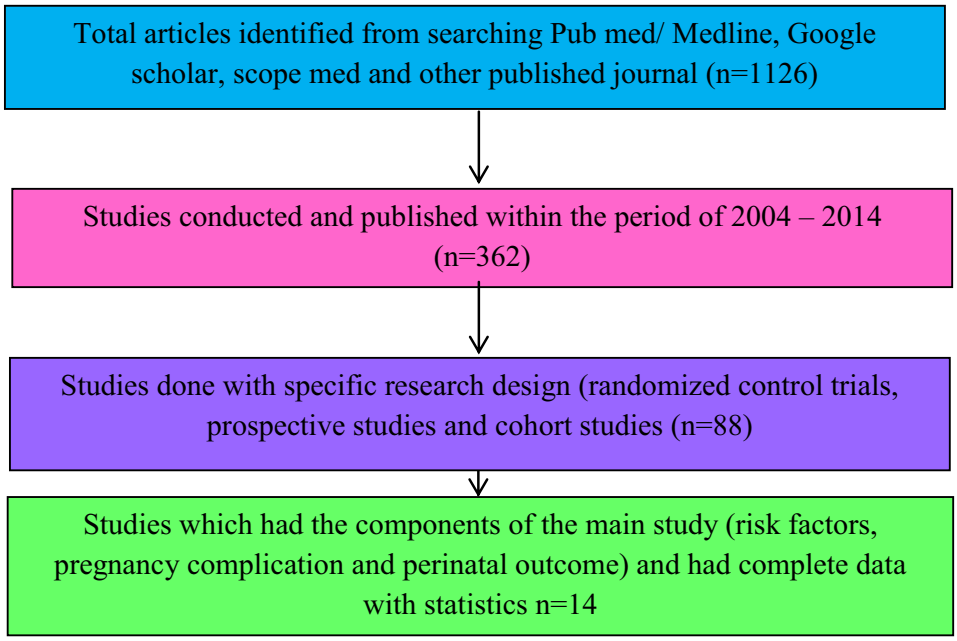
The study title was fragmented into various smaller terms and phrases in order to have a comprehensive and extensive review and analysis. The key words used were risk factors of anemia in pregnancy, gestational diabetes mellitus and pregnancy induced hypertension, maternal and fetal outcome of anemia in pregnancy, gestational diabetes mellitus, pregnancy induced hypertension and life style risk factors of pregnancy complications.

3.4.3 Language

Studies which was published in English language was included in the study.

The full text studies were selected initially by the researcher and it was verified by the research guide and the statistical information were confirmed by statistician.

SCHEMATIC REPRESENTATION OF STUDY SELECTION



3.5 ELIGIBLE PARTICIPANT POPULATION

Samples of all primary studies were taken as samples for the present meta-analysis. Antenatal mothers with anemia, GDM and PIH were taken as the samples in all the studies and were monitored during the time of delivery to assess the maternal and fetal outcome.

3.6 DATA EXTRACTION

The researcher had reviewed all the studies and categorized the studies as studies on risk factors of anemia in pregnancy, gestational diabetes mellitus and pregnancy induced hypertension and studies related to maternal and perinatal outcome of anemia, GDM, PIH. All the studies where assessed for its methodological quality (the extent to which the study has been designed and executed without any systematic error or bias), precision (usually shown as 95% confidence limit).Then the researcher extracted data and condensed the data with its statistical values along with the title of the study, year, nature of the sample and the size with the geographical area in a tabular form.

3.7 DATA SYNTHESIS

Pooling of data was done in this stage by using the statistical methods. Most often pooling of the Odds ratio or Relative risk ratio and 95% confidence limit was done. Summarized these results in the forest plots. Forest plot is the standard format used recently to present the meta analysis results. The point estimate of the Odds ratio (OR) or Relative risk (RR) of individual trials is represented as solid boxes and 95% confidence limit is represented as horizontal lines (as shown in fig. 4.1). The line drawn in the middle of the picture is known as the “line of no effect” and in case of OR and RR, it is associated with the risk ratio of 1.0.

DATA ANALYSIS AND INTERPRETATION

Totally 14 studies were pooled from PubMed, Google scholar, scope med, and other published journal to assess the maternal life style factors on pregnancy complication and perinatal outcome for the purpose of analysis and interpretation

The quantitative data from the various studies were grouped and analyzed as per the objectives set for the study. The pooled results were plotted using forest plot.

A “forest plot” or “blobbogram” is a graphical representation designed to illustrate the relative strength of effects in multiple quantitative scientific studies addressing the same question. Forest plots commonly presented with two columns, where the land hand column lists the names of the studies like RCTs or epidemiological studies in chronological order. The right hand column is the area for point estimate or plot of measure of effect and confidence limit incorporated in each study were marked as horizontal lines. A vertical line represents the no effect of the assessing component. Relative Risk (RR) is a statistical method that used to compare the difference in results between two groups in which one group has a risk factor. An Odds Ratio is a measure of association between an exposure and outcome.

1. RR or OR> 1: Increased likelihood of outcome in treatment group.
2. RR or OR< 1: Decreased likelihood of outcome in treatment group.
3. RR or OR = 1: No difference of outcome between the groups.
4. Confidence Interval(CI) indicates the precision of the estimate. If wider the interval, less the precision. If CI includes 1 which indicates no statistical significant difference and if CI doesn’t includes 1 shows statistically significant difference.

The findings are presented under the following sections.

ORGANISATION OF DATA

SECTION 4.1: Tabulated data from the 14 primary studies.

SECTION 4.2: Analysis of the risk factors of pregnancy complications.

SECTION 4.3: Analysis of maternal outcome of pregnancy complications.

SECTION 4.4: Analysis of fetal outcome of pregnancy complications.

SECTION 4.1: TABULATED DATA FROM THE 14 PRIMARY STUDIES

Study and year	place	Sample	Sample size(n)	Risk factors	%	complication	%	Maternal outcome	%	Fetal outcome	%
Maternal and perinatal outcome in varying degree of anemia. Yr : 2004	India	Pregnant women	447	Age Parity	27-31 >3	Pre eclampsia	2(1.6) 8(3.7) 2(2.5) 4(12.9 Mean:4	Induction of labour <u>Indications:</u> IUGR Post maturity Pre eclampsia PROM Rh incompatability Abruption placenta Prolonged labour Cesarean section Instrumental delivery PPH PPH with BT	8(6.5) 12(5.4) 7(8.8) 5(16.1) Mean:8 2.25 1 2.5 0.5 0.75 0.75 OR: 2.74 6.6 4 Mean: 9.5 5.5 1.25 1.25	Preterm Low birth weight IUGR Apgar<8 Birth asphysia Infectious complications	25(20.3) 48(22.4) 18(22.7) 12(38.7) Mean: 25.75 28.25 3.25 3.5 2 4.5

Study and year	place	Sample	Sample size(n)	Risk factors	%	complication	%	Maternal outcome	%	Fetal outcome	%
Effect of paternal and maternal life style factors on pregnancy complication and perinatal outcome. Yr : 2014	Netherland	All pregnant mothers and mothers within 6 months after delivery	2264	Pre pregnancy BMI Pre pregnancy BMI	OR: 1.12 95% CI: 1.09-1.16 OR: 1.13 95% CI 1.08- 1. 18	Hypertensive pregnancy complication GDM	241 (10.6) 50 (2.2)	Spontaneously delivered preterm	79(3.5)	SGA	155(6.8)
Effect of dietary factors in pregnancy on risk of pregnancy complication – cohort study, 2011	Norway	Pregnant women	23,423	<u>Dietary pattern</u> Vegetable pattern Processed food <u>Vitamin D intake</u> From diet+ supplementation (15-20µg) Supplementation (10-15µg)	 OR: 1:0.72 CI: 0.62-0.85 OR: 1:1.21 CI: 1.03-1.42 23% 27%	Pre eclampsia					

Study and year	place	Sample	Sample size(n)	Risk factors	%	complication	%	Maternal outcome	%	Fetal outcome	%
Association of young maternal age with adverse reproductive outcome	America	White girls and women	134,088	Teenage mothers: (13-17yrs) Older teenage: (18-19yrs) Normal mothers: (20-24yrs)				Delivered prematurely	RR: 1.9 95% CI 1.7-2.1	Low birth weight Small for gestational age	RR: 1.7 95% CI: 1.5-2.0 RR: 1.3 95% CI: 1.2-1.4
Effect of life style intervention on dietary habits, physical activity and gestational weight gain in obese pregnant women – RCT 2010	Belgium	Obese pregnant women	195	Dietary intake Physical activity		Pregnancy induced hypertension Pre eclampsia	14 (34.1) 1 (2.3)	Induction of labour Cesarean section	21 (48.8) 7 (16.3)	Birth weight > 4000g	3 (7)
A randomized control trial of life style intervention in 360 obese pregnant women. Yr : 2011	Denmark	Obese pregnant women	360	Obesity BMI 30-45 Kg/m²		GDM Pre eclampsia / PIH	8(5.2) 28 (18.2)	Cesarrean section All Emergency Planned	 39 (25.3) 28 (18.2) 11 (7.1)	Birth weight GA(days) Large for gestation Birth weight >4000g Admission in ICU	3,593 (3335-3930) 283 (274 – 289) 18(11.7) 39(25.3) 22(14.3)

Study and year	place	Sample	Sample size(n)	Risk factors	%	complication	%	Maternal outcome	%	Fetal outcome	%
Caffeine intake and hypertensive complication Yr 2010		Pregnant women	7890	Caffeine intake: <2 units/d N= 4833 2-3.9 u/d N= 2450 4-5.9 u/d N= 497 ≥6 units/d N=110		Pre eclampsia (PE) PIH PE PIH PE PIH PE PIH PE PIH	P= 0.379 P= 0.593 2.2 1.6 1.6 3.7 3.4 3.2 1.0 3.8				
Difference in birth outcome in relation to maternal age. Yr: 2010		Pregnant mothers	8568	Maternal age						Gender(boys) Birth weight (g) GA (wks) Preterm delivery SGA LGA	P= 0.85 P=<0.001 P=0.003 P=0.150 P=0.064 P= <0.001

Study and year	place	Sample	Sample size(n)	Risk factors	%	complication	%	Maternal outcome	%	Fetal outcome	%
Prevalence of GDM and associated risk factors at a tertiary care hospitals, 2011	Haryana	Antenatal mothers	607	Age >25yr BMI>25kg/ m^2 Family h/o DM Family h/o HTN Family h/o GDM Weight gain >7kg	144 (23.7) OR: 3.795 CI: 2.020-7.131 50 (8.24) OR: 4.627 50 (8.24) OR: 2.356 36 (5.93) OR: 2.886 3 (0.49) OR: 27.463 77 (12.68) OR: 2.594	GDM	43(7.1)				

Study and year	place	Sample	Sample size(n)	Risk factors	%	complication	%	Maternal outcome	%	Fetal outcome	%
Maternal anemia and its impact on perinatal outcomein tertiary care hospital.- cohort study, 2004	Pakistan	Pregnant women	629	Age Education Up to 10 Above 10 Employment outside home housewife family structure extended nuclear monthly income <20000 20000 - 30000 30000 – 50000 >50000 [no statistically significant difference between grp]	26.85 (4.77) 264 49 265 48 202 111 114 99 82 18	Anemia	313	Perinatal mortality	6(rr:3.2, Ci:0.7-14.6)	Pre term birth Low birth weight IUGR Low apgar at 1 min Low apgar at 5 min IUD	79(rr:4.0, Ci:2.5-6.3) 42(rr:2.2, Ci:1.3-3.7) 41(rr:1.9, Ci:1.1-3.3) 32(rr:2.1, Ci:1.2-3.7) 27(rr:1.7, Ci:1.0-3.1) 5(rr:2.5, Ci:0.7-13.0)

Study and year	place	Sample	Sample size(n)	Risk factors	%	complication	%	Maternal outcome	%	Fetal outcome	%
Relationship between maternal hemoglobin and perinatal outcome: cohort study,2007	Rawalpindi, Pakistan	Pregnant women	860 402 anemic	Age(years) <u>Maternal education</u> Matric and above Up to primary Illiterate <u>Family structure</u> Extended Nuclear <u>Monthly income</u> <5000/- 5-10000/- >10000/-	25.85 64 203 135 252 150 187 113 102	Anemia	402	Perinatal mortality	7(rr:3.5)	Pre mature birth Low birth weight IUGR Low apgar at 1 min Intra uterine fetal death	62(rr:3.4) 41(rr:1.8) 39(rr:1.7) 35(rr:1.7) 11(rr:2.2)
The rate and risk factors for anemia among pregnant mothers in Jerteh Terengganu, malaysia: a cross sectional study,2009	Malaysia	Antenatal mothers	47	Hematinic compliance	OR: 4.571 Ci: 1.068-15.573 P value: 0.041	anemia	57.4% Ci:43.0-72.0				

tudy and year	place	Sample	Sample size(n)	Risk factors	%	complicatio n	%	Maternal outcome	%	Fetal outcome	%
Prevalence of anemia and associated risk factors among women attending antenatal care in azezo health care center, 2013	North west ethiopia	Pregnant women	384	Age 26-34 >34 years h/o malaria attack infections with hookworm Ascarislum bricoides S. mansoni Giardia intestinalis	 AOR: 2.21 CI:1.24 - 3.96,P =0.001 AOR: 2.72 CI:1.12 -6.43, AOR: 13.21 CI:3.54 -49.72 AOR: 13.21 CI:3.62 -48.28 AOR; 8.98 CI:2.08 -38.75 AOR: 3.53 CI:0.21 -60.6 AOR: 9.58 CI:1.5-61.4	Anemia Mild anemia Moderate Severe	83 41(49) 38(46) 4(5)				

tudy and year	place	Sample	Sample size(n)	Risk factors	%	complicatio n	%	Maternal outcome	%	Fetal outcome	%
Severe maternal anemia and neonatal outcome: prospective case control, 2014	Karnataka India	Pregnant women at third trimester	200			Anemia (<7g/dl)		Labour induced Cesarean section	26% 17% P value= 0.001	Premature birth Low birth weight IUGR IUD Apgar<5 at 1min	OR:1.657 CI:1.283-2.141 OR:2.838 CI:2.128-3.784 OR:1.962 CI:1.577-2.441 OR:1.845 CI:1.403-2.427 OR:1.642 CI:1.202-2.243
Prevalence of GDM and its outcome in Jammu region: prospective study, 2010	Jammu and Kashmir	Antenatal mothers				Gestational diabetes mellitus		PPH PROM Abortion Gestational hypertension Cesarean section Preterm delivery(<37wk)	2(2.7) 1(1.61) 2(2.7) 4(6.45) 14(22.58) 10(16.13)	Congenital anomalies LBW LGA(>4 Kg) Still birth RDS Shoulder dystocia >4kg	1(1.6) 5(8.2) 10(16.12) 3(4.84) 2(3.23) 6(9.6)

The above table 4.1.1 depicts the description of the study with study title, year, place, study population, size, risk factorsits odds ratio and percentage, pregnancy complications with its odds ratio and maternal and fetal outcome

SECTION 4.2: ANALYSIS OF MATERNAL LIFE STYLE FACTORS ON PREGNANCY COMPLICATION

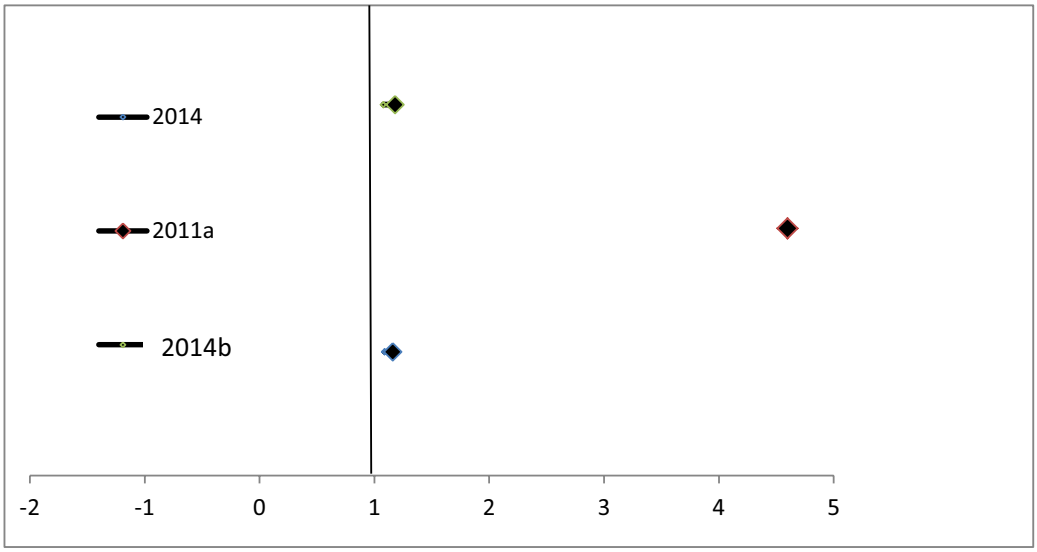


Fig 4.2.1: Forest plot method showing the significance of BMI with maternal complication

Table 4.2.1: Risk ratio and 95% confidence limits of BMI

Sl no.	Risk factors	Year	Risk ratio	95% confidence limits	
				Lower limit	Upper limit
1.	BMI	2014	1.12	1.09	1.16
2.		2011	4.627	2.16	9.87
3.		2014b	1.13	1.08	1.18

2014:` A study conducted in Netherland among 241pregnant women who developed PIH
2014b: Study conducted in Netherland among 50pregnant women who developed GDM

The above table 4.2.1 shows the risk ratio and the 95% confidence limits of BMI from various studies.

The fig 4.2.1 shows that the Body Mass Index were statistically (OR: 1.12, 1.13) and clinically significant with the 95% confidence limit of 1.08 – 1.18, 1.09 – 1.16. So it was evident from the table and forest plot method that BMI of more than 25 kg/m^2 was a significant risk factor for the maternal complications.

SECTION 4.3: ANALYSIS OF MATERNAL OUTCOME OF PREGNANCY COMPLICATION

4.3.1 MATERNAL MORTALITY

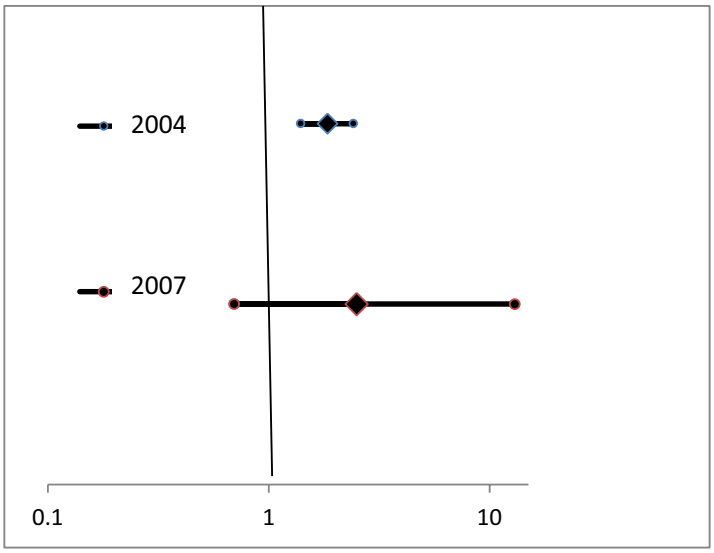


Fig 4.3.1 shows the significance of maternal mortality as a perinatal outcome

Table 4.3.1: Risk ratio and 95% confidence limit of maternal mortality

Sl.no..	Maternal outcome	Year	Risk factors	95% confidence limit	
				Lower limit	Upper limit
1	Maternal mortality	2004	3.2	0.7	14.6
2		2007	3.5	1.8	10.8

Table 4.3.1 shows the risk ratio and 95% confidence limit of maternal mortality

Fig 4.3.1 shows that the mortality is statistically and clinically significant in a study done in the year 2007 with a confidence limit of 1.8-10.8 and odds ratio of 3.5. In an another study conducted in the year 2004 shows that the maternal mortality is statistically significant with an odds ratio of 3.2 but shows clinical non-significance with 0.7 lower limit .Thus maternal mortality is an adverse maternal outcome of pregnancy complication statistically.

4.3.2 OTHER MATERNAL OUTCOMES

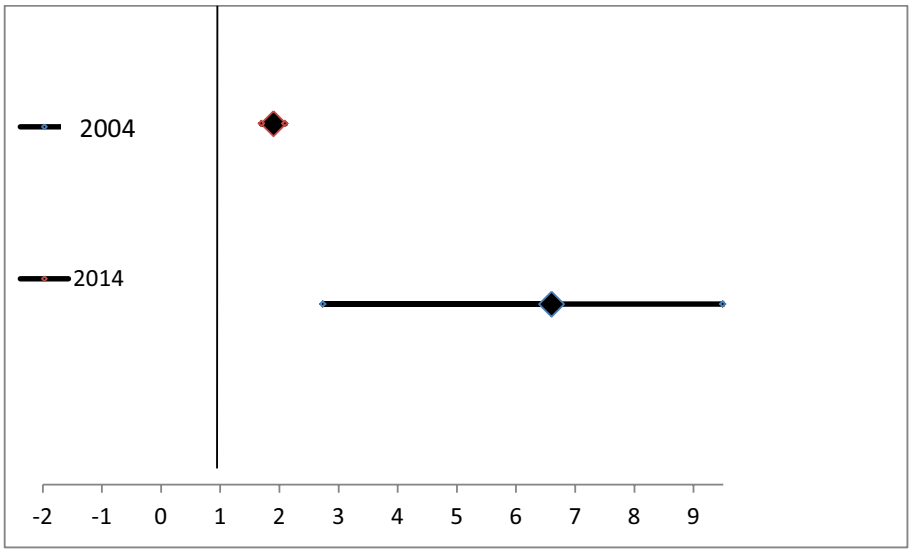


Fig 4.3.2 shows the point estimate of maternal outcomes

Table 4.3.2: Risk ratio and 95% confidence limit of maternal outcome

Sl.No..	Maternal outcome	Year	Risk ratio	95% confidence limit	
				Lower limit	Upper limit
1	Prolonged labor	2004	6.6	2.74	9.5
2	Premature delivery	2014	1.9	1.7	2.1

Table 4.3.2 gives the risk ratio and the 95% confidence limit of adverse maternal outcome like prolonged labor and premature delivery.

As per the fig 4.3.2 maternal outcomes like prolonged labor, premature delivery has statistical significance as maternal outcome with an odds ratio of 6.6 and 1.9 respectively. It also shows a clinical significance with 95% clinical significance of 2.74 – 9.5 and 1.7 –2.1 on adverse maternal outcome.

SECTION 4.4: ANALYSIS OF FETAL OUTCOME OF PREGNANCY COMPLICATIONS

4.4.1 APGAR SCORE

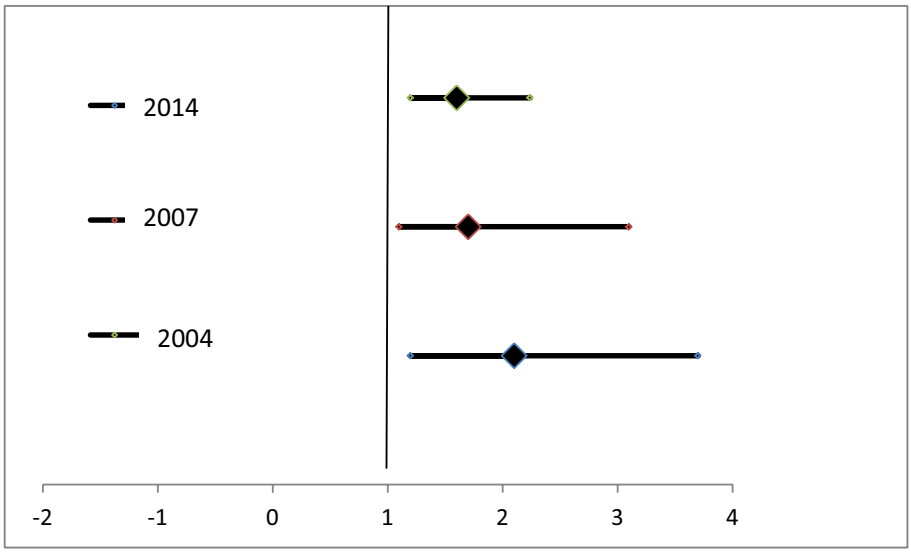


Fig 4.4.1 shows the significance of Apgar score as an adverse perinatal outcome

Table 4.4.1: Odds ratio and 95% confidence limit of low Apgar score

				Lower limit	Upper limit
1	Low Apgar score	2004	2.1	1.2	3.7
2		2007	1.7	1.1	3.1
3		2014	1.6	1.2	2.24

Table 4.4.1 shows the odds ratio value and the 95% confidence limit value of low Apgar score

The risk ratio of 2.1, 1.7, 1.6 from three different studies shows that low Apgar score were statistically significant as an adverse perinatal outcome and the confidence limits of 1.2- 3.7, 1.1 – 3.1, 1.2 – 2.24 shows that low Apgar score was also clinically significant with narrow interval limits. Thus low Apgar score was an adverse fetal outcome of pregnancy complications.

4.4.2 INTRA UTERINE GROWTH RESTRICTION (IUGR)

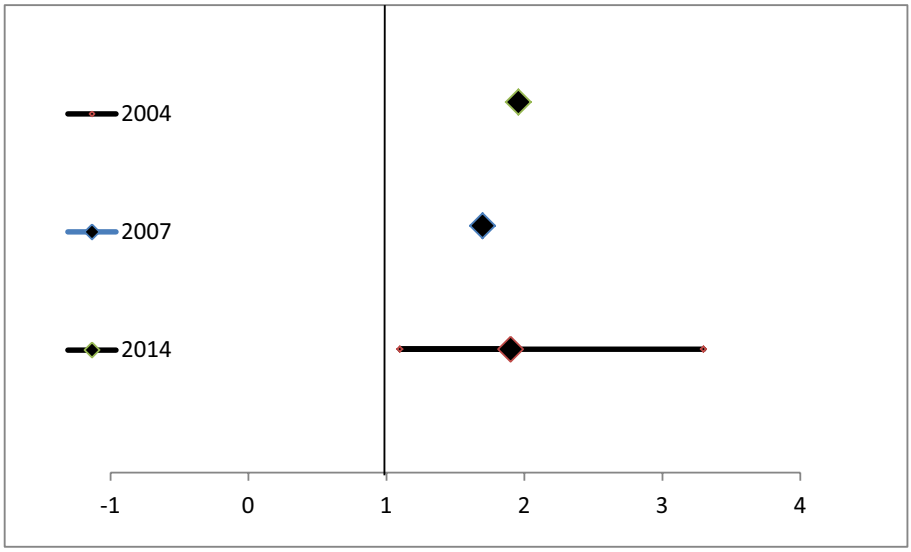


Fig.4.4.2 shows the forest plot graph of significance of IUGR as an adverse outcome

Table 4.4.2: Risk ratio and 95% confidence limit value of IUGR

Sl.No.	Perinatal outcome	Year	Risk ratio	95% confidence limits	
				Lower limit	Upper limit
1	IUGR	2004	1.9	1.1	3.3
2		2007	1.7		
3		2014	1.96		

Table 4.4.2 shows the risk ratio and the confidence limit of IUGR

The fig 4.4.2 illustrates that IUGR is an adverse fetal outcome of pregnancy complications like GDM, PIH, anemia in pregnancy. From the table 4.4 is statistically and clinically significant with an risk ratio of 1.9, 1.7, 1.96 and 95% confidence limit as 1.1-3.3.

4.4.3 LOW BIRTH WEIGHT (LBW)

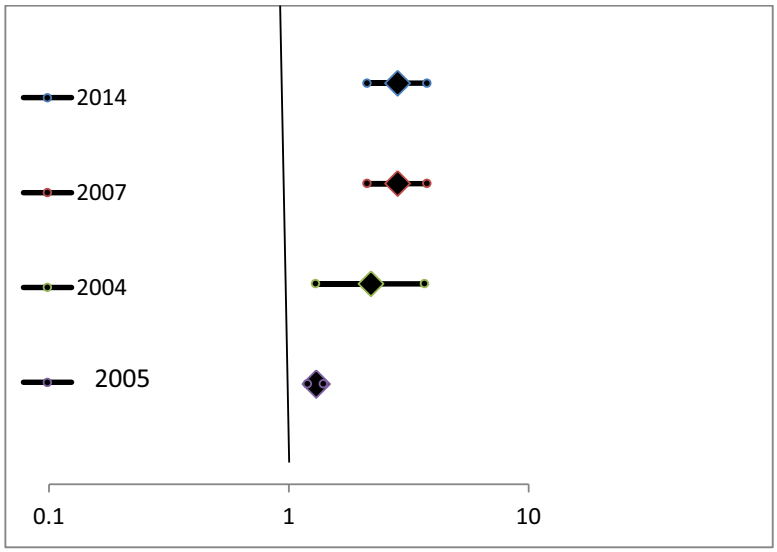


Fig 4.4.3 shows the significance of LBW as a perinatal outcome

Table 4.4.3: risk ratio and 95%confidence limit of low Apgar score

Sl.No.	Perinatal outcome	Year	Risk ratio	95% confidence limit	
				Lower limit	Upper limit
1	Low birth weight	2005	1.7	1.5	2.0
2		2004	2.2	1.3	3.7
3		2007	1.8		
4		2014	2.84	2.13	3.78

Table 4.4.3 shows the risk ratio and the 95% confidence limit of low birth weight Fig 4.4.3 infers that LBW is statistically and clinically significant with 95% confidence limit of 1.2- 1.4, 1.3 – 3.7, 2.13 – 3.78 and risk ratio of 1.3, 2.2, 1.8, 2.84. So LBW is a significant fetal outcome.

4.4.4 INTRA UTERINE DEATH

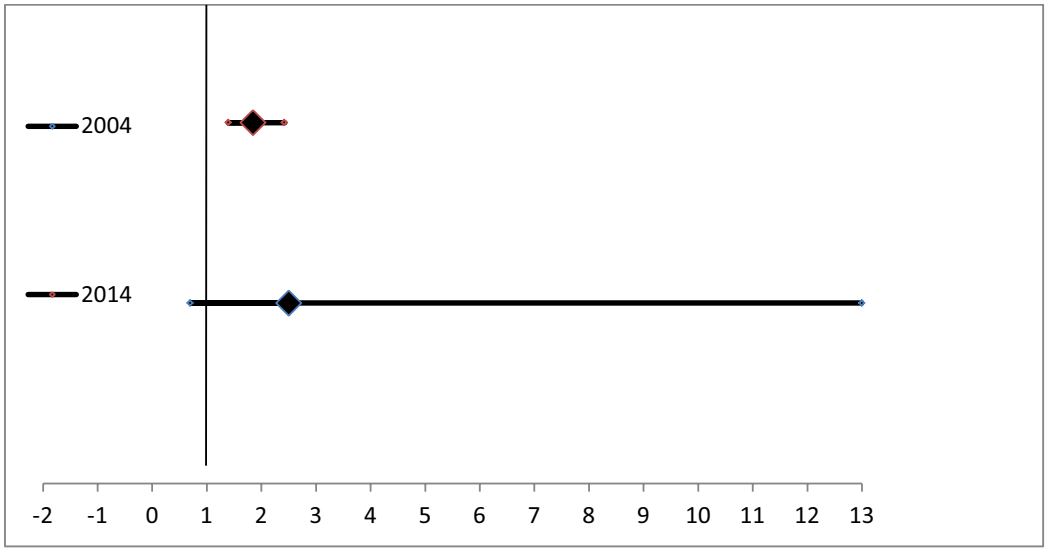


Fig 4.4.4 shows the significance of intra uterine death as fetal outcome

Table 4.4.4: Risk ratio and 95% confidence limit of intra uterine growth retardation

Sl.No..	Fetal outcome	Year	Risk ratio	95% confidence ratio	
				Lower limit	Upper limit
1	IUD	2004	2.5	0.7	13
2		2014	1.845	1.4	2.427

Table 4.4.4 gives the risk ratio and 95% confidence value of IUD

IUD is statistically significant in both the studies with an odds ratio of 2.5, 1.845 as an adverse fetal outcome in relation with pregnancy complication like GDM, PIH and anemia in pregnancy. In the study which was conducted in the year of 2014 shows the clinical significance with a 95% confidence limit of 1.4 – 2.427 whereas non-significance was elicited with a 95% confidence limit of 0.7 – 13 in another study.

DISCUSSION

The study was conducted to assess the effect of maternal life style factors of pregnancy complication and perinatal outcome.

This chapter deals with the discussion on the findings of the study interpreted from the statistical analysis. The findings are discussed in relation to the objectives of the study, related literature and hypothesis specified in the study.

5.1 The description of the 14 primary studies

The primary studies were selected based on the inclusive and exclusive criteria. Total of 1126 studies were taken from various databases like Google scholar, Pub med, Scope me, i-search and various other published journals. 7 studies from the South East Asian region was included in the of which 4 was Indian and remaining studies were taken from other countries. Studies with specific research design like randomized control trials, prospective and cohort studies were selected for the analysis considering its statistical significance. The participant populations of the primary studies were antenatal mothers who developed the pregnancy complications.

The meta-synthesis findings from the table 2.1 showed that the risk factors for the pregnancy complications were pre pregnancy BMI>25kg/m^2, pregnancy weight gain, poor dietary pattern(caffeine and tea intake, deficient vitamin D intake and poor nutritional diet), and lack of physical activity. Any two or more combination of the factors contributes in the occurrence of the complications like PIH, GDM, and anemia in pregnancy. The other risk factors identified from the meta synthesis are family history of Diabetes Mellitus and Hypertension, maternal age, parity, low socio economic and hematinic compliance and history of malaria in case of anemia.

The meta-analysis of the 14 primary studies was categorized under two main headings namely maternal life style factors complicating pregnancy and pregnancy complications and its adverse maternal and fetal outcome.

5.2 The first objective was to assess the maternal life style factors complicating pregnancy

Under the first objective increased maternal body mass index was the one factor which had significant association with the occurrence of the complications like anemia, GDM, PIH and this significance was elicited in fig 4.2.1 and table 4.2.1.

The analysis in fig 4.2.1 showed that the Body Mass Index is statistically (OR: 1.12, 4.627, 1.13) and clinically significant with the 95% confidence limit of 1.08 – 1.18, 2.16- 9.87, 1.09 – 1.16 respectively. So it is evident from the table and forest plot that increased BMI of more than 25 kg/m^2 is a significant risk factor for the maternal complications.

The data for the analysis of BMI was taken from 2 different studies conducted in two different geographical area which showed a high odds ratio for GDM among Indian population whereas lower level of odds ratio for GDM was shown in Netherland. Also the difference in the sample size of the two studies makes a difference in the odds ratio value. From the analysis it is evident that increased BMI was a risk factor for the occurrence of the GDM and PIH. Therefore difference in cultural practice can also have a minor role in the occurrence of pregnancy complications.

The study findings were consistent with a descriptive transversal study conducted by **Latifa Mochhoury (2013)** among 1408 women in Moroccan population to assess the effect of Body Mass Index and gestational weight gain and its obstetric outcome. The researcher had recruited non-diabetic women without several hypertension delivering singletons from 37 completed weeks to 42 weeks gestation. The risk of moderate hypertension were higher among overweight or obese women as well as among women whose weight gain was >16kg. The differences were significant <0.05. Thus the study concluded that overweight women before pregnancy and weight gain during pregnancy are associated with higher risk of maternal and neonatal complications.

The above findings were also consistent with a prospective non-randomized descriptive study conducted by **Vellanki Venkata Sujatha et.al (2011)** on high body mass index in pregnancy and its effect on maternal and fetal outcome among 200 samples

in KIMS, Narketpally.100 women with high BMI were compared with 100 women with normal BMI with regard to antenatal complications, maternal morbidity and neonatal outcome.

The above findings were consistent with a cross sectional study done by **Rajin Arora, Darin Arora, Jayanton P, (2013)** among 5420 pregnant women to assess the adverse pregnancy outcomes in women with high pre pregnancy body mass index. The study results showed that the proportion of pregnant women with overweight and obesity were 11.1% and 3.9% respectively. Then after multiple logistic regression analysis women in obesity group were correlated with the pregnancy complications like pre-eclampsia, gestational diabetes and found significance with each other.

5.3 The second objective was to correlate the maternal life style factors with the pregnancycomplication and perinatal outcome.

The perinatal outcome was classified under maternal and fetal outcome. Maternal outcome includes maternal mortality, prolonged labor and premature labor whereas fetal outcome included low birth weight, low Apgar score, IUD and IUGR.

Fig 4.3.1 showed that maternal mortality is statistically and clinically significant with 95% confidence limit of 1.8 – 10.8 in one study whereas another study showed only statistically significant with the odds ratio of 3.2 and shows maternal mortality is not clinically significant with 95% confidence limit of 0.7 – 14.6. Thus the perinatal mortality is a statistically significant maternal outcome.

Maternal mortality was assessed from 2 studies conducted in the South East Asian region during 2004 and 2007. Even after a small duration of time maternal mortality was observed to be a same outcome of the pregnancy complication especially with anemia in pregnancy. Thus it was confirmed that maternal mortality is an adverse outcome of anemia in pregnancy.

Fig 4.3.2 and table 4.3.2 explains the association of prolonged labor and premature delivery with the pregnancy complications. Prolonged labor and premature delivery has statistical significance as maternal outcome with an odds ratio of 6.6 and 1.9 respectively.

It also shows a clinical significance with 95% narrow confidence limit of 2.74 – 9.5 and 1.7 –2.1 as adverse maternal outcome.

2 studies were taken for analyzing prolonged labor and premature labor. Prolonged labor was positively related to pre-eclampsia and anemia. Pre-eclampsia was observed to be high in moderately anemic mothers and thereby resulting in prolonged labor. Thus prolonged labor is confirmed negative outcome of anemia and pre-eclampsia.

Fig 4.4.1 and Table 4.4.1 shows the significance of low Apgar score as an adverse neonatal outcome with the Odds ratio and 95% confidence limit values respectively.

The analysis in the fig 4.4.1 shows the significance of low Apgar score as an adverse perinatal outcome. The risk ratio of low Apgar score is 2.1, 1.7, 1.6 from three different studies which shows that it is statistically significant as an adverse perinatal outcome and the narrow confidence limits of 1.2- 3.7, 1.1 – 3.1, 1.2 – 2.24 shows that low Apgar score is of high clinical significance.

The study results revealed that low Apgar at 1 min and 5 min was strongly associated with pregnancy complications especially with anemia in pregnancy. Anemia in pregnancy was observed to be more common in South East Asian countries with low socio economic status, thus resulting in adverse maternal and fetal outcome during antenatal period and intra natal period.

The fig 4.4.2 illustrates that IUGR is an adverse fetal outcome of pregnancy complications like GDM, PIH, and anemia in pregnancy. From the table 4.4 it is evident that IUGR is statistically and clinically significant with an risk ratio of 1.9, 1.7, 1.96 and 95% confidence limit as 1.1- 3.3 respectively.

The meta-synthesis and analysis results revealed that IUGR was significantly associated with anemia in pregnancy in South East Asian region. The risk factors for the occurrence of anemia in pregnancy were found to be dietary pattern and low socio economic status but which was not statistically evident with forest plot method.

Fig 4.4.3 and table 4.4.3 illustrates the significance, risk ratio and 95%b confidence limit of low birth weight as a fetal outcome

Fig 4.4.3 revealed that LBW is statistically and clinically significant with 95% confidence limit of 1.2- 1.4, 1.3 – 3.7, 2.13 – 3.78 and risk ratio of 1.3, 2.2, 1.8, 2.84. High low birth weight rate was observed in 2014in a study conducted in India among 200 antenatal mothers with anemia at third trimester, whereas, studies conducted during 2004 and 2007 showed only low rate of low birth weight babies. This difference was because of the severity of anemia and the gestational age of the mother. Thus it can be concluded that low birth weight is a confirmed neonatal outcome of severe maternal anemia.

Fig 4.4.4 and table 4.4.4 shows that IUD is statistically significant with an odds ratio of 2.5, 1.845 as an adverse fetal outcome in relation with pregnancy complication like GDM, PIH and anemia in pregnancy. In the study which was conducted in the year of 2014 shows the clinical significance with a 95% confidence limit of 1.4 – 2.427 whereas non-significance was elicited with a 95% confidence limit of 0.7 – 13 in another study conducted during 2014.

Meta synthesis findings from table 2.1 revealed that the adverse maternal outcome of GDM, PIH, and anemia in pregnancy included preterm delivery, gestational hypertension, premature rupture of membrane, cesarean section, post partum hemorrhage, abortion, induction of labor, prolonged labor, instrumental delivery, and perinatal mortality whereas the adverse neonatal outcome included small for gestational age, increased rate of admission to NICU, congenital anomalies, low birth weight, large for gestational age, still birth, respiratory distress syndrome, pre mature birth, intra uterine growth retardation, low Apgar of less than 5, birth asphyxia, and intra uterine death.

The findings were supported by a study conducted by **Radhia Khan et.al (2013)** on maternal and fetal outcome of gestational diabetes mellitus among 227 pregnant women at Institute of chemical science, Pakistan. The study results revealed that Women with gestationaldiabetes were more prone to pregnancy induced hypertension (22.3%, $p<0.05$), pre-eclampsia (16.5%, $p=0.02$), premature rupture of membranes (19.4%, $P=0.002$), preterm labor (25.2%, $p=0.001$) and cesarean delivery (23.3%, $p=0.009$) as compared to controls whereas in case of neonatal complications there was increased risk

of macrosomia (28.2%, p=0.001), shoulder dystocia or birth trauma (27.2%, p<0.001) and jaundice (29.1%, p=0.001).

The above study findings is found to be consistent with the study conducted by **Anand .V.C, Olga Basso (2010)** on impact of pregnancy on stillbirth and neonatal mortality in first and higher order births. The study results revealed that PIH was associated with an increased risk of still birth and neonatal death. During the study period the researcher had observed that the increased risk of stillbirth was higher in women having their second or higher order birth. The study concluded that a substantial burden of still birth and neonatal mortality is associated with PIH especially among multiparas women.

The study findings was also found consistent with a retrospective population based cohort study conducted by **Vijaya Kancherla et.al (2014)** on adverse perinatal outcomes associated with moderate or severe maternal anemia based on parity in Finland. The study results revealed that the prevalence of anemia during pregnancy was 2.5% among nulliparous women and 2.3% among multiparas women. Among multiparous women anemia was associated with preterm delivery, small for gestational age, admission to NICU was found to be statistically and clinically significant whereas congenital malformations was found to be statistically significant.

Thus the researcher concludes that pregnancy complications were more common in women with increased BMI and anemia was more among Southeast Asian women. Maternal complication was more associated with GDM and PIH whereas fetal complications were more observed in anemic mothers.

Hence the hypothesis stated earlier that **“There is a significant relationship of lifestyle factors with the pregnancy complication and perinatal outcome”** was accepted from the meta-analysis.

So the researcher suggested that the maternal modifiable factors like BMI, dietary factors and physical activity had to be taken care during pregnancy to prevent pregnancy complications andto reduce the maternal and neonatal mortality rate.

SUMMARY, CONCLUSION, IMPLICATION, RECOMMENDATION AND LIMITATION

This chapter presents the summary, conclusion, implication, recommendations, and limitation of the study.

6.1 SUMMARY

Pregnancy is a unique, exciting and often joyous time in a woman's life, as it highlights the woman's amazing creative and nurturing powers while providing a bridge to the future. Pregnancy comes with some cost, however, for a pregnant woman needs also to be a responsible woman so as to best support the health of her future child. Consequently, pregnant women must take steps to remain as healthy and well-nourished as they possibly can.

Lifestyle can affect the health of the future baby, even prior to conception. Because developing baby will entirely depend on their mother's body for nourishment and protection, it is wise to alter a women's lifestyle prior to conception so that she can eliminate any bad habits or risk factors that might compromise her health during pregnancy.

The purpose of the study was to assess the effect of maternal life style factors on pregnancy complication and perinatal outcome.

6.1.1 The objectives of the study were

1. To assess the maternal life style factors complicating pregnancy.
2. To correlate the maternal life style factors with pregnancy complication and perinatal outcome.

6.1.2 The study was based on the assumption that

1. The maternal life style factors have an effect on pregnancy complications.
2. The maternal life style factors and pregnancy complication have an effect in adverse perinatal outcome.

6.1.3 The hypothesis formulated were

There is a significant relationship of life style factors with pregnancy complication and perinatal outcome.

The investigator has done an in depth meta synthesis on 14 primary studies which is supported by both theoretical and empirical related studies and statistics which provided a strong foundation for the study, including the basis for conceptual framework and to frame association between the risk factors, pregnancy complication and perinatal outcome.

The conceptual frame work for the study was based on the Grounded Theory of Glaser and Strauss with action research which provided a comprehensive framework for the research.

The main study was conducted with 14 primary studies selected from various journals. The search strategies for the studies were studies between 2004-2014 from various online journals and other published journals. The study was selected based on various criteria.

Statistical data was taken from the selected studies the data was analyzed using the forest plot method. The findings revealed that there was significant association with the risk factors of pregnancy complications and perinatal outcome.

6.1.4 The major findings of the study revealed that:

After doing the meta-synthesis various life style risk factors for pregnancy complications were identified like pre pregnancy BMI>25kg/m^2, pregnancy weight gain >7 kg (OR: 2.594), poor dietary pattern (caffeine and tea intake and vitamin D intake) and physical activity.

The main pregnancy complications focused in this study was gestational diabetes mellitus, pregnancy induced hypertension, and anemia in pregnancy. The labor outcome was classified under maternal and fetal outcome. The major maternal outcome identified was preterm delivery, pre mature rupture of membrane, cesarean section, post-partum

hemorrhage, abortion, induction of labor, prolonged labor, instrumental delivery and maternal mortality.

The fetal outcome of the pregnancy complication were small for gestational age, congenital anomalies, low birth weight, large for gestational age >4 kg, still birth, respiratory distress syndrome, preterm babies, intra uterine growth retardation, low Apgar score less than 5 at 1 min, birth asphyxia.

The findings as per the meta analysis, two of the risk factors showed significance association with the pregnancy complications. The major risk factor for pregnancy complications identified were increased body mass index (RR: 1.12, 4.627, 1.13).

The maternal outcome of the complications were maternal mortality (RR: 3.2, 3.5), prolonged labor (RR:6.6) and premature delivery (RR: 1.9) in which the maternal mortality was statistically significant but found to be not clinically significant.

The fetal outcome identified was low Apgar score, intra uterine growth retardation, low birth weight, intra uterine death. The entire fetal outcome showed statistical significance with an odds ratio of more than 1 and clinical significance with narrow 95% confidence interval.

6.3 IMPLICATIONS

The most consistent finding in this review was the recognition of the major risk factor for the pregnancy complications like GDM, PIH and anemia and its maternal and fetal outcome. This study results showed the importance of prevention of occurrence of pregnancy complications and thereby reducing the perinatal mortality and morbidity. Thus the study findings can be utilized in formulating the policies and guidelines for high risk pregnancies towards the safe maternal and fetal outcome at institution, regional health care service system.

6.4 RECOMMENDATIONS

1. The investigator recommends to utilize the study findings in the same institution to provide health education to the antenatal mothers regarding the prevention of pregnancy complication.
2. The investigator recommends the students of Omayal Achi College of Nursing to utilize the study findings while giving the health education to the antenatal mothers during their clinical experience.
3. The investigator recommends to utilize the study findings in the primary health centre to detect the risk factors and thereby early detection of pregnancy complications among antenatal mothers.

The study recommends the following for future research

1. The same study title can be used to conduct a study among the antenatal mothers in a large population in an Indian setting to increase the validity and generalizability of the findings.
2. A comparative study to assess the risk factors of pregnancy complication and its adverse pregnancy outcome can be done
3. A descriptive study can be done to assess the prevalence and risk factors of pregnancy complication.
4. Separate studies can be conducted to assess the risk factors of GDM, PIH and anemia in pregnancy and its adverse maternal and fetal outcome.
5. An experimental study can be conducted to assess the effectiveness of preventive strategies of pregnancy complication.

6.5 LIMITATIONS

1. The Researcher found difficulty in gathering the extensive Indian reviews for the study analysis.
2. The study was limited due to the less number of studies in the selected study title.
3. Due to the less number of studies the researcher was unable to find the heterogeneity and the effect size among the studies.
4. The researcher found difficulty in doing the publication bias using the funnel plot method.

6.6 PLAN FOR RESEARCH DISSEMINATION

- The research findings will be disseminated in the national and international conferences conducted at various institutions and also will publish in various Nursing journals.

6.7 PLAN FOR RESEARCH UTILIZATION

- The research findings can be utilized in formulating a risk assessment checklist to assess the level of risk among antenatal mothers visiting OACHC and an educational interventional package can be developed to modify the risk factors and thereby preventing the pregnancy complications.

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National Institute of Child health and Human Development (2013)

World Health Organization (2014)

APPENDICES

Love to Serve
அறஞ்செய விரும்பு

INTERNATIONAL CENTRE FOR COLLABORATIVE RESEARCH
OMAYAL ACHI COLLEGE OF NURSING
Run by MR Omayal Achi MR Arunachalam Trust

ETHICAL CLEARANCE CERTIFICATE

Valid from: April 2013
Valid to: October 2015 (2 Years)

Name of the Principle Investigator: Ms. Sulu Susan Rajan, M.Sc.(N) Student (Obstetrics and Gynecological Nursing)

The **ICCR** Ethical Committee meeting had reviewed the project titled **" A meta analysis study to assess the effect of maternal life style factors on pregnancy complications and perinatal outcome".** The proposal was found to be acceptable on ethical grounds. The Principle Investigator has the responsibility and accountability for any other administrative / regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review.

This certificate of approval is valid for the time period provided, there is no change in the methodology protocol or consent process and documents.

Any significant change should be reported to Director for Research Committee considerations in advance for its implementation.

Signature of Research Director :

Research Director
ICCR
Omayal Achi College of Nursing
No. 45, Ambattur Road,
Puzhal, Chennai-600 066.

Signature of Researcher :

45, AMBATTUR ROAD, PUZHAL, CHENNAI - 600 066. TAMIL NADU, INDIA
Tel : 26591617, 26591618, Fax : 26591616, E-mail : iccrphc@gmail.com, Website : www.omayaln.com

APPENDIX B

CERTIFICATE FOR ENGLISH EDITING

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms.Sulu Susan Rajan, M.Sc nursing II year student of Omayal Achi College of Nursing Chennai, conducted a dissertation work on **"A meta-analysis study to assess the effect of maternal lifestyle factors on pregnancy complication and perinatal outcome. 2015"** under the guidance of Mrs.R.Vijayalakshmi as a partial fulfillment of the The Tamil Nadu Dr. M.G.R medical university requirement for the award of M.Sc Nursing degree is edited for English language appropriateness by M. ANURADHA [PGT ENGLISH]

Signature with Date: 7/8/15

Seal:

Mrs.M.ANURADHA, M.A., B.Ed., M.Phil.
PGT English
Smt. M. J. V. Hr. Sec. School,
Arumbakkam, Chennai-600 106.

APPENDIX – C

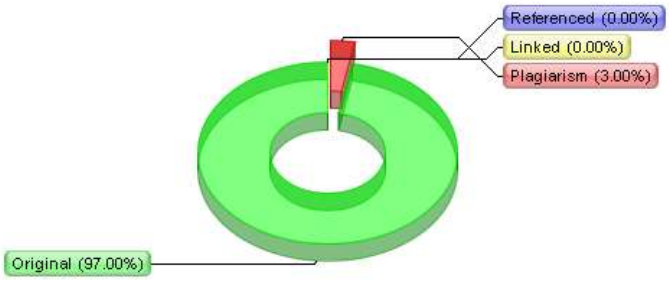
Plagiarism Detector - Originality Report

Plagiarism Detector copy registered to:
Dr. Kanchana
Khan
Software core version: **850**

Originality report details:

Generation Time and Date:	07/08/2015 4:44:42 PM
Document Name:	Plagarism copy-sulu.docx
Document Location:	C:\Documents and Settings\admin\Desktop\Plagarism copy-sulu.docx
Document Words Count:	13322
Check time [hs:ms:ss]:	00:04:24

Plagiarism Detection Chart:

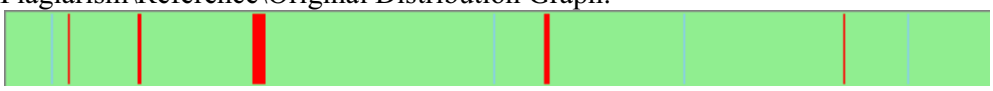


Referenced 0% / Linked 0%

Original - 97% / 3% - Plagiarism

Processed Resources List: [click below to open] **Processed Ok: 66 Failed: 4**

Plagiarism\Reference\Original Distribution Graph:



APPENDIX – D

M.Sc (N) DISSERTATION EXECUTION PLAN

S.NO	ACADEMIC CALENDER MONTHS	OCTOBER 2013 to SEPTEMBER 2014												OCTOBER 2014 to SEPTEMBER 2015											
		O	N	D	J	F	M	A	M	J	JU	A	S	O	N	D	J	F	M	A	M	J	JU	A	S
A	**Conceptual phase**																								
1	Problem identification																								
2	Literature review																								
3	Theoretical framework																								
4	Hypothesis formulation																								
B	**Design & planning phase**																								
6	Research design																								
7	Search strategies																								
8	Study selection																								
9	Eligible population selection																								
10	Data collection plan																								
11	Ethics procedure																								
12	Finalization of plans																								
C	**Empirical phase**																								
13	Data collection																								
14	Data preparation																								
D	**Analytical phase**																								
15	Data analysis																								
16	Interpretation of results																								
E	**Dissemination phase**																								
17	Presentation or report																								
18	Utilization of findings																								
	Calendar months	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9